K HICANO CASSIC CBSC. PART 1.

THE MODEL ENGINEER

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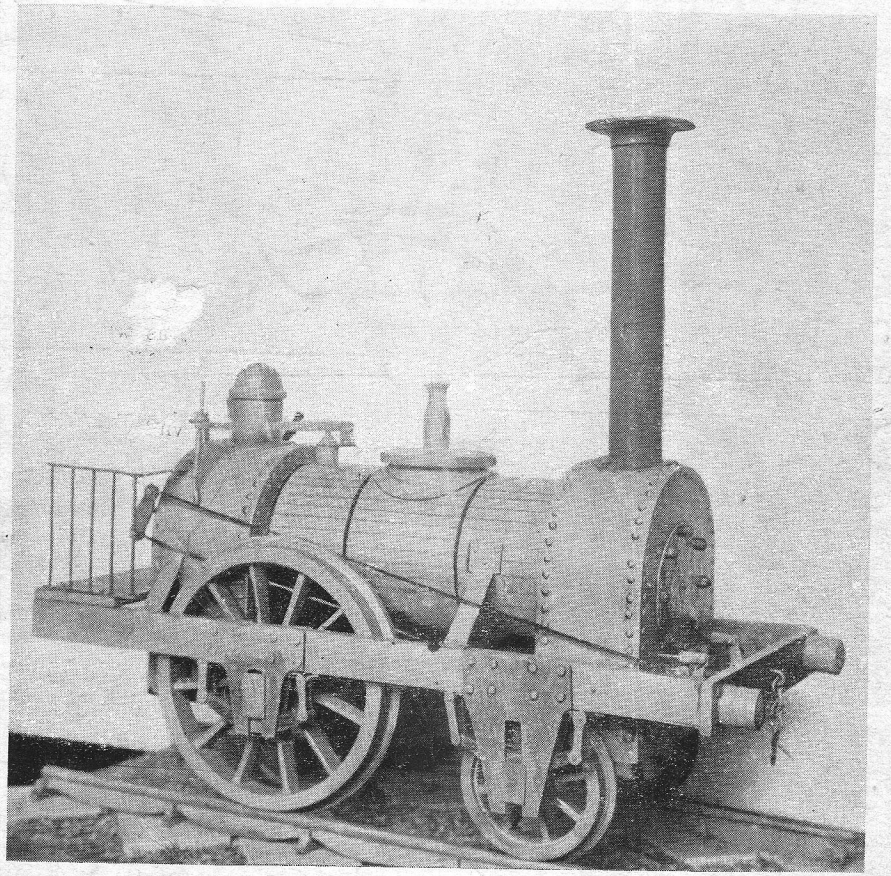


This illustration is taken from what is, obviously, a very old print that has come into our hands. The model is clearly of one of the "Planet"-type engines of the early 1830s; but as to its size and origin, no particulars whatever are available. Can any reader supply information about it?

THE MODEL ENGINEER

Vol. 94 No. 2333 Percival Marshall & Co., Limited Cordwallis Works, Maidenhead January 24th, 1946

Smoke Rings

Petrol Motors at Birmingham

A NOTE from Mr. W. H. Kesterton, Hon. Secretary of the Birmingham Society, speaks in glowing terms of the interest aroused by Mr. E. T. Westbury's recent lecture on model petrol engines. He writes: "Even the non-petrol members were gripped by his enthusiasm, and if he had carried on much longer we think there would have been a few converts! He ended up by taking to pieces a tiny two-stroke engine in about three seconds. It amazed us, a few turns of his wrists, and the engine lay in bits before us." There was a record attendance of members, so many turned up, in fact, that quite a few failed to get nearer than the door.

Greetings from Queensland

IT is a long cry from Brisbane in Australia to Maidenhead, but not too far for a cheery letter from Mr. C. H. Garner to bring us the season's greetings from the Queensland Society of Model and Experimental Engineers. Mr. Garner writes: "With the transition from war to peace production, the model engineer can now look forward, we hope, to much more happy times and pleasant evenings spent in this very relaxing pastime. We are already experiencing increase in membership and the Society looks forward with confidence to the future. THE MODEL ENGINEER is still our most popular reading and finds pride of place in our library. Incidentally, the excellent articles by 'L.B.S.C.' are always eagerly awaited and digested by our locomotive enthusiasts. With best wishes for long health and happiness to yourself, not forgetting a toast to the future and bigger success of THE MODEL ENGINEER." Thank you, Queensland members, your good wishes are warmly reciprocated.

The Late Col. R. Henvey

IT is with great regret that I have to record the passing of Col. R. Henvey, a well-known figure in the world of both model engineering and model railways. Col. Henvey had a distinguished military career in the Royal Artillery, and was awarded with the C.M.G. and the D.S.O. for his services, which dated back to the Boer War. His model-making began with a working model of a mountain gun, the first of a series of pieces of ordnance of all sizes. This was made during the siege of Ladysmith. He subsequently gave much attention to railway modelling, in ½-in. scale, and also built a beautifully finished model of a brigantine. An enthusiastic yachtsman, he had a very comprehensive knowledge of ships, and at many of our exhibitions he very kindly collaborated in the judging of our ship model section, when his great regard for accurate detail was much appreciated. When examining models, I have seen him produce a cigarette from his case, and placing it on the model, declare that this or that detail was in or out of scale. He knew the exact length of a cigarette and used it as a convenient measuring stick. At his home at Shirley Park he had a fine workshop, and encouraged the youth of the neighbourhood to come in and learn something about models and mechanical work. I had many enjoyable chats with him about ships and models, and even about the philosophy of life, for Col. Henvey could talk charmingly and profoundly on many subjects, and had a deep regard for human responsibilities and relationship. It is sad to think that he was incapacitated by ill-health during the last four years of his life. We have all lost a delightful friend and member of the true model engineering brotherhood.

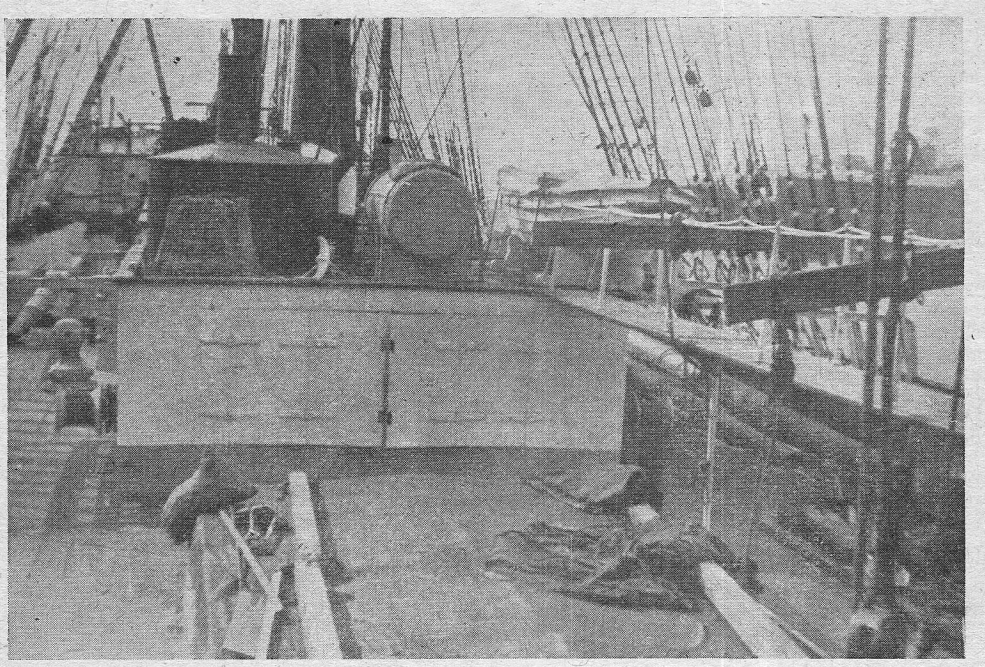
An Exhibition Prize

THE first offer of a special prize for the 1946 MODEL ENGINEER Exhibition, reaches me from Mr. F. L. Gill-Knight, who, as many readers will remember, has a keen interest in electric traction. He kindly offers a prize of £3 3s. for the best piece of work in any category relating to electric traction. the only condition being that the entry shall incorporate some features of full-sized practice, either of construction or control. This may start you thinking.

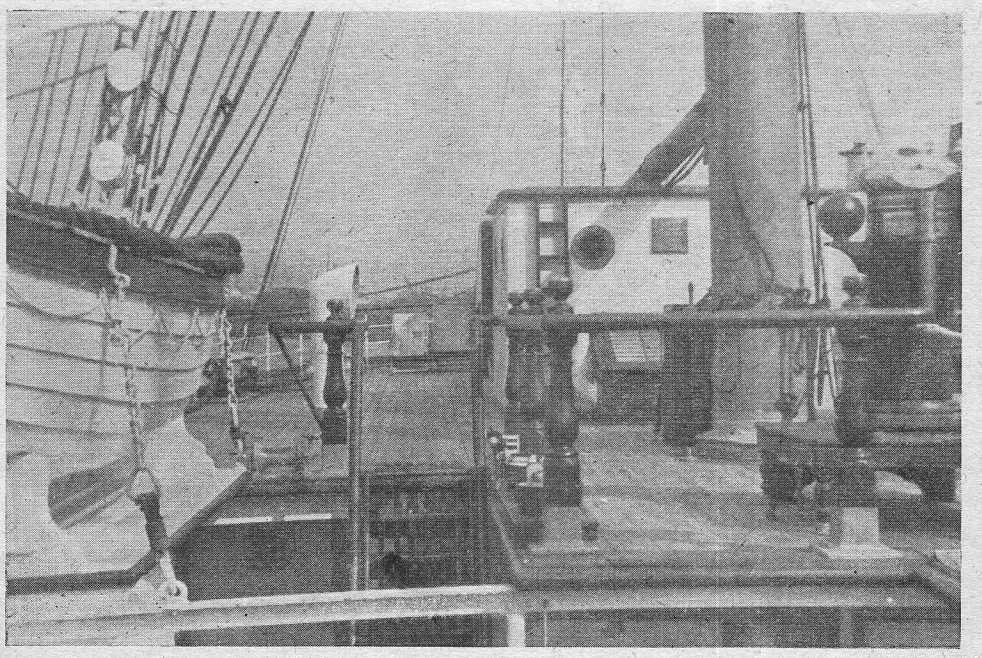
Eighty Locomotives on Tap

I HEAR that the plot of ground on which it was intended to erect the Malden Society's Club rooms and workshop, has had to be relinquished, as the local authorities did not consider these buildings appropriate for what has been scheduled as a residential area. Enquiries for a more suitable location are now being made. Mr. Tonnstein tells me that the Society now has 20 locomotives on call for its Beverley Park track, with 19 more available for occasional service. Another 15 are expected to be completed his year, and a still further 26 are under construction. A striking picture of the activities of a Society in which every member pulls his weight, and every member has a voice and a direct incentive in promoting progress.

Percival Marshall



Looking forward from main hatch



The poop from corner of half deck

*"MARGARET" By W. R. HALLETT

THERE seemed to be only one solution, which was the fitting of an angle-strip round the top of the hull from front to stern.

Anxiety was increasing as to the weight of the boat, provision originally having been made for a very light engine. Angle-strip would add still further to the weight, and things began to look as though we should finish up with not a paddle-steamer but a submarine! Well, the only course was a visible test; so up we went to the bathroom (where our static-water tank resided) and the hull was put into the water. Result—deep depression, both of me and the boat. Hardly any free-board, and the angle-strip, superstructure, paddle casings and wheels, funnel, mast and bridge were still to be fitted! Downstairs again. Out came the engine to have its flywheel and base honeycombed with drill holes in an endeavour to lighten up. (I haven't a lathe, so could not take any skims off anything). Back again to the bathroom for a further test, and a little better outlook; but the boat was still deep in the water.

(Here I would digress to say that the boat was finished off, painted and underwent its trials, but the original length of 25 in. was not enough. She went quite nicely, but not as well as I should have liked, being too deep in the water; so after trials I brought her home and took her right down again, inserting a piece of brass strip—which by now had suddenly become available!—3 in. long, in front of the paddle-wheels, and another piece 5 in. long aft of them, thus increasing the length of the boat to 33 in.)

With ample buoyancy, all was well, so an approach was made to the deck. This consists of a piece of brass sheet (almost foil thickness) which runs the full length of the boat, and three hatches formed, one at the stern for easy access to the spirit container, one running right up to the funnel, and the other over the boiler. These will easily be discernible from the general plan, Fig. 4, in which (*a*) is box-shaped at the bottom and lifts completely off, (*b*) section is hinged and tilts forward (shown in more detail in Fig. 3 (*a*), where the hinge is indicated, (*c*) lifts right out, and (*d*) is also box-shaped and comes right off. It will therefore be apparent that almost the whole of the inside of the hull opens up, and any necessary adjustments are quite easy to make.

The deck was soldered to the angle-strips already mentioned, and the sides of the hatches were set back about $\frac{5}{8}$ in. from the side of the boat, leaving a passenger promenade, but still enabling sufficient room to be left to lift out the engine as and when necessary.

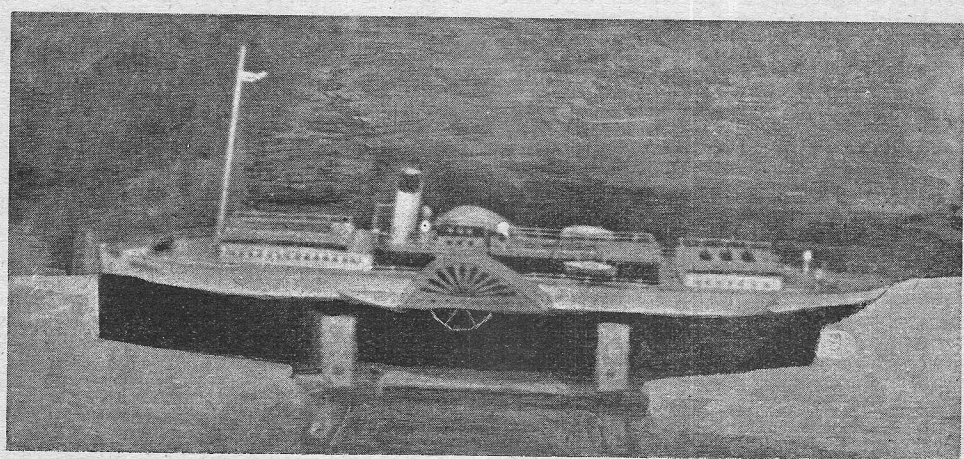
Now, the two paddle-wheels were slipped on the open ends of the shaft and firmly soldered to it, a blob of solder first being run down the spacing tubes to ensure a good grip.

The paddle-boxes presented very little difficulty, being scribed and then filed to outside shape, and slots cut with an Abrafile as recommended by "L.B.S.C." some time ago. As the flywheel is on the port side of the boat, the pump, displacement lubricator, and steam piping were placed to starboard, so helping to balance matters up. Sponsons and paddle-boxes were soldered into place.

The fore hatch was built up to take the form of a lamp baffle and topped with a passengers' seat running parallel with the hull, Fig. 4 (*e*), and surrounded by rails. The aft-hatch cover is built up to look similar to the front cover, but has not baffle. This is surmounted by three seats indicated at Fig. 4 (*f*), and also surrounded by rails.

Rails also run all round the deck, and a simple way of ensuring equal depth of the rail-pins (which actually are made from common household pins) is to scribe their position accurately on the deck, make a small hole for each with an old

* *Continued from page 76, "M.E.," January 17, 1946.*



"Margaret" in dry dock

moment suddenly becoming apparent. So it was in this case.

The morning had been still with hardly any wind, but p.m a breeze sprang up just in time for our advent at the pond-side. *Margaret* was steamed, and set off in high style, but 30 ft. or so offshore, she began to slow up and made the rest of the journey at a snail's pace. Set off from the other side, she " ditto repeatoed." Next trip she got half-way across and at such low speed her way was not sufficient for rudder steering, and she performed a perfectly marvellous series of evolutions before coming home to port.

Obviously she had " got the wind " in some way and, instead of her lamp burning nicely, it was being blown off the boiler, which therefore could not maintain pressure.

I came back home and sat down and thought. The lamp in use needed only a breath of air apparently to keep the flames " wandering." What we wanted was some sort of vaporising lamp—but how to make it ?

as I used only about two-thirds to half of the spirit formerly needed.

Finally, a " flame trap " was fitted, shown in Fig. 5 at (*b*). Any blowback of the flame we were now getting would have seriously damaged the paintwork, and the sliding cover (1) effectively stops any such danger.

In Fig. 5 I have added, at (*c*), a rough layout plan which gives a bird's-eye view of the salient features with decks removed.

It was with some trepidation that I set out on what proved to be final tests, but I was rather glad to find on reaching the water that there was a reasonable breeze blowing, as this would decide if we were now all correct.

A final check-up before the trip, then steam was raised, and the *Margaret* floated with paddles spinning merrily. I made one mistake, which was to give her just a little too much rudder, so that for the whole of the first run she steamed in a wide circle, just sufficiently off-shore

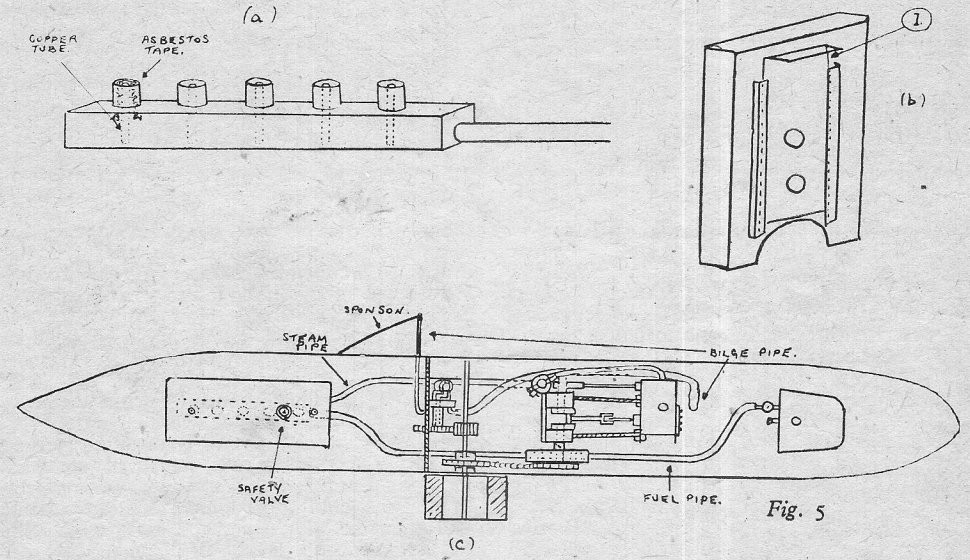


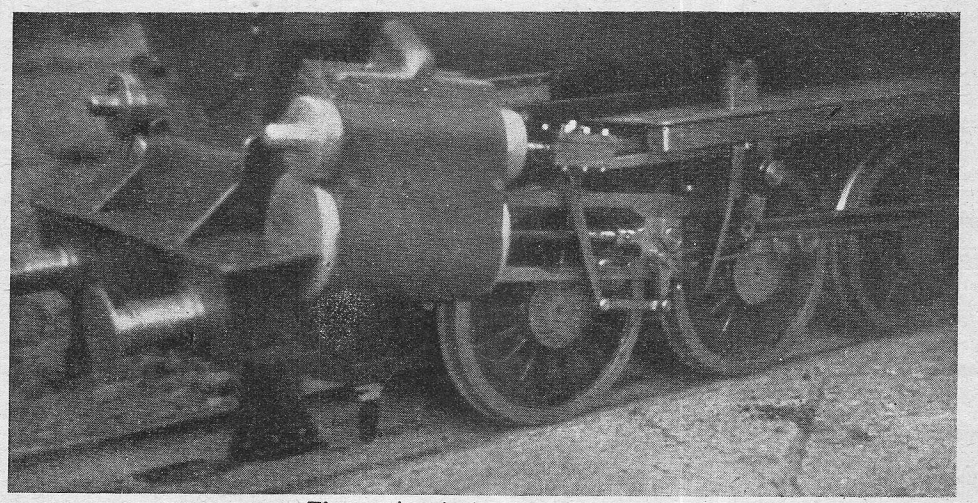
Fig. 5

I therefore tried a scheme of my own which came, so to speak, out of the blue. The lamp was removed and another cut from similar square tube to the same shape ; see Fig. 5 (*a*). Next, five pieces of brass tube were soldered into holes drilled in the top of the spirit-box. Into the tubes I pushed pieces of asbestos tape wound round 3/32-in. external copper tube, the asbestos going part way down and the tube right into the spirit.

The lamp was tried on the bench, and seemed to burn much the same as an ordinary wick lamp ; but I wanted to see what would happen when it got really hot, so under the boiler it went. The boiler was lagged all round with asbestos to keep the heat in, and the lamp lit. It took about three minutes to get warmed up, and then it vaporised perfectly. Looking inside, you could see spurts of flame where the spirit was vaporising and igniting. On steam the engine revved round, and the flame had to be tamed by retarding the drip feed ; and it must have turned the meth. to gas to be out of reach. The meth. tank had not been filled to capacity, but, notwithstanding this, she chugged serenely on for a good 30 minutes. When I got her again, the rudder was set for straight gearing, and the boat steamed back and forth across the pond, then diagonally, and then up and down the longer banks ; but she did not falter once.

There was only one drawback, i.e. the failure of the bilge-pump after some pretty good work, and subsequent inspection proved the cause of this to be " oil choking," as the lubricant which was being used for piston-rod and engine bearings was thick motor oil, which got nice and loose in its tank in the heat of the hold, but, on running down the frames and coming into contact with the bilge water, it changed into a very " solid " liquid, eventually blocking the oscillating cylinder inlet-hole ! The easy answer to this one in future will be to use a thinner oil, and no further difficulty in this direction is anticipated.

mation I could obtain. A definite plan of action decided upon, a start was made by first making a complete set of patterns for cylinders, wheels, etc., this, by the way, is what I always do, as I find you get exactly what you need, and, after all, pattern-making is not a very formidable job to the model engineer. The main-frames were made from $\frac{1}{8}$-in. black strip, with gunmetal horn-blocks. These, by the way, were slotted in the lathe by a method described a few years back in this journal, this method of machining is, in my opinion, the only practical way of doing this job. The slotter in question was made up from scrap material in a matter of hours, and has since been used on many other jobs, with equal success. Steel axleboxes 1 in. × 1 in. × $\frac{1}{2}$ in., fitted with P.B. bushes, and sprung with two-coil springs per box, I did intend using leaf springs as on "Emma Senior" but gave way in favour of the former, owing to their snappy action.



The motion begins to take shape

The next problem was the cylinders, and, believe me, they were a problem too, here again I was unable to follow the prototype owing to the length of the steam passages, so four slide-valves of amply proportions, were fitted, two on top outside, and two underneath inside. I did this, to get my boiler centre-line somewhere near the real one. The cylinders are $1\frac{1}{8}$ in. × $1\frac{3}{4}$ in., I have since found out that these are over-size, owing to lack of detailed information at the time, but I think this can be remedied at a later date, if necessary. The steam ports are $\frac{1}{8}$ in. × $\frac{3}{4}$ in. and $\frac{1}{4}$ in. × $\frac{3}{4}$ in. respectively. The valve gear is, of course, Walschaerts, made as near to prototype as good working would permit. The inside valves are actuated by a rocker gear, which is situated just in front of the outside motion plates. A rod with a slight set in it, takes the drive from the top of the combination-lever back to the top of the rocker-arm, just clear of the radius-rod, where it is transferred through the frame-plates to the inside valves, which, as I stated above, are situated underneath the inside cylinder block. This form of rocker gear was the only method I could adopt without upsetting the outward appearance of the model. At any rate it seems to function quite well on air test, but I think I shall be better qualified to talk when it has had a bit of wear.

The entire motion is made of steel. The four big-ends are $\frac{1}{2}$ in. × $\frac{5}{16}$ in.; being an engineer by profession, I know the value of ample bearing surface! The outside big-ends don't look out of place anyway. The outside cylinders have inclined port faces, this was done to enable me to get the valve-spindle over the centre of the valve, as described in one of Mr. Greenly's articles, some years back. Buckle drive is fitted throughout. There are two oil pumps fitted, one each side on the running-boards. The pumps are operated from the expansion links, as in full-size practice. I favour this method of drive in preference to the usual method, because you get the same swing on the ratchet lever no matter what cut-off you are using. There are two boiler feed-pumps situated just above the crankshaft. Here again, the drive is somewhat original. I got my idea from the G.W.R. It is similar to the inclined Stevenson's motion on their two-cylinder engines. The two eccentrics drive at an inclined angle to a pendulum-lever on a cross shaft, and are taken back through short links to the ends of the pump rams, only one pump is fitted with a by-pass. I have not yet fitted the steam brake cylinders, there should be two separate units, one operates the first six blocks and the other operates the remaining four.

I am at present working on the boiler; this is $4\frac{3}{8}$ in. diameter with Belpaire firebox. My original intention was to fit a narrow box as on the prototype, but on advice received from our worthy friend "L.B.S.C.", I decided to make the Wooton-Belpaire pattern as fitted to L.M.S. "Pacifics." This does not affect the outward appearance of the locomotive at all, as the bottom

Meet "Hielan' Lassie"

By "L.B.S.C."

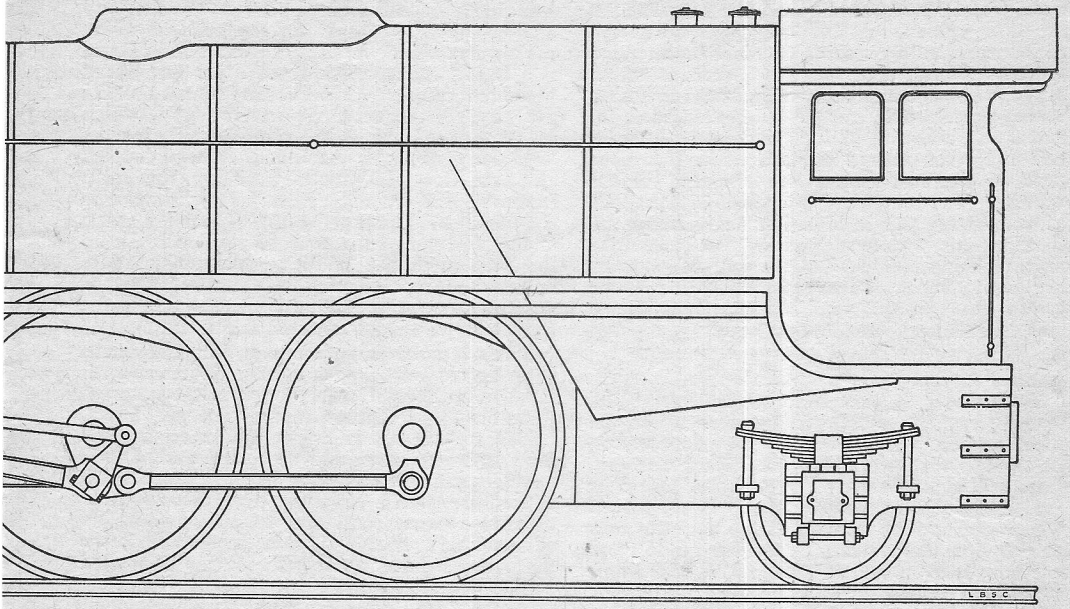
BEING about one of the most unconventional and unorthodox persons on the outside of this unlucky planet, I am going to kick off the serial story of the "Flying Scotsman's" bonny wee daughter, with a kind of confession! After my "Gallup poll" to find out whether the followers of these notes wanted a description of how to build a Stroudley engine, or a London and North Eastern Pacific, had resulted in an overwhelming majority for the latter, I obtained a sectional chart of the full-sized engine, and started in to make the necessary alterations for a real snorter on 3½-in. gauge, with my usual "guarantee." However, there are a number of points in the Gresley Pacifics with which I don't agree; number one on the list is the three cylinders driving on the one axle. This means that the inside cylinder has to be cocked high up to let the connecting-rod clear the leading coupled axle; and as the two-to-one conjugation for driving the middle valve cannot be altered in timing, the valve chest has to be set horizontally, at a different angle altogether from that of the cylinder, and the crank set to the valve, instead of vice versa, in order to get proper steam distribution. I could see this stunt causing some heartburnings among our fraternity when they got thus far on the job! There were sundry other little discrepancies which I needn't mention here; and I saw there were some violent stirrings of grey matter ahead (literally, in more senses than one!) to compose the proper "words and music" and guarantee the tune.

Meantime, Sir H. N. Gresley's worthy successor, Mr. E. Thompson, had "killed the Cock-o-the-North," as the song says, and made a Pacific out of its remains. The resurrected "Cock" had a divided drive. Now, that "still small voice" which has been with me since childhood, bade me bide a wee, and see if anything further developed on the L.N.E.R.; and sure enough it did, a "Green Arrow" being finished off as a 4-6-2, instead of 2-6-2, also with divided drive. That settled it; I knew what was going to happen, as surely as if Mr. Thompson had called and told me about it. So I scrapped my original plans for "Hielan' Lassie," and got out a rough drawing of her as a sort of step-sister to "Tugboat Annie," having a longer wheelbase, divided drive, three separate valve gears; all cylinders in same plane; inside and outside connecting-rods as near the same length as I could get them; a glorified edition of the "A4" boiler with double chimney and "streamline" dome casing, all complete except for smoke deflectors; and sundry other blobs and gadgets. As my head is now unable to tackle the job of running two serials "in parallel" in this journal, and "Petrolea" had still some time to run, I didn't say a word to anybody, but "sat tight" to see if a rebuilt "A1" or "A3" would make its appearance on the L.N.E.R. before it was time to start my new serial. As you all know, *Great Northern* herself has just been rebuilt; and a comparison of her in the new form, with my tentative sketch of "Hielan' Lassie," proved an amazing example, once again, of big practice unconsciously following small. Except that I had shown a longer bogie wheelbase, with the rear bogie wheel partly behind the outside cylinder, like "Tugboat Annie," Mr. Thompson's design and my own were practically identical, even to the abolition of splashers, new high running board, and outside exhaust pipes! All I have had to do is to shorten the bogie wheelbase, and make the rear bogie wheels clear the outside cylinders; so "Hielan' Lassie," as you see her, is thus a small edition of the latest thing in express locomotives on the L.N.E.R. I told you she would be worth waiting for!

Spots of Bother

In passing, I wonder how many new readers—or old ones, for that matter—realise what it actually entails, to scheme out a locomotive on 3½-in. gauge, give a full description of how to build it, and *guarantee results*! It is easy enough to draw an outline of a full-sized engine, give a few tentative sizes of an equivalent small one, say, in effect, "bore the cylinders, turn the wheels, erect the valve-gear," etc., etc., and leave the onus of making it work on the unfortunate builder, blaming him if it doesn't. Well, that isn't your humble servant's way; as I build locomotives myself, I'd hate to "lead anybody up the garden." Beginners might be excused for imagining that a slavish copy of a full-size job would give the same results in proportion to size; it wouldn't, because you can't "scale" Nature, a remark as true today as ever it was. For instance, consider a little cylinder; if "scaled down," the walls would be too thin, the piston would crumple up under steam pressure, and the general construction would be too flimsy to stand hard work. The little cylinder has to be designed *for its job*, same as a big one, and all things taken into consideration; therefore, the working equivalent of a big cylinder 19 in. by 26 in., for a 3½-in. gauge engine, comes out much bigger, especially in overall length, than a "scale" reproduction. Where this cylinder has, for example, to go between two wheels, and only just clears on the full size job, the wheels of the small engine would have to be set farther apart, entailing an alteration in frame length; this, in turn, affecting the length of the boiler, and so on, right through the whole outfit!

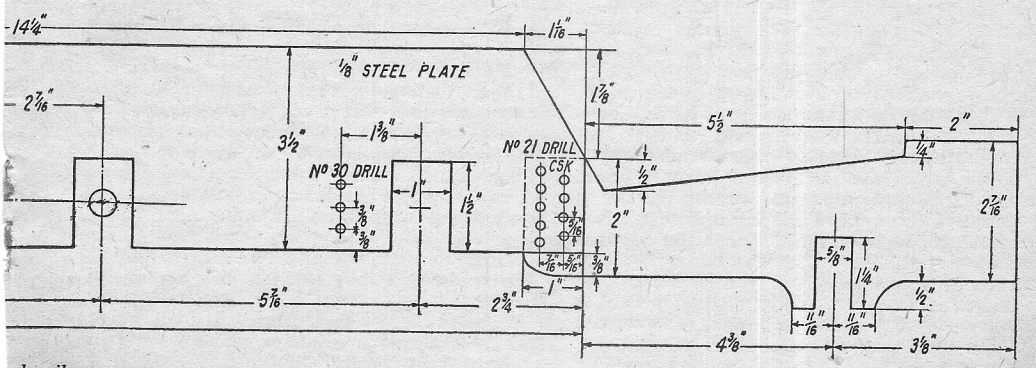
Substitution of slide-valves for piston-valves is another bad headache. It was my original intention to specify piston-valves for the cylinders of "Hielan' Lassie"; but I had so many



"*Absolutely the latest fashion—and NOT for export!*")

has separately-sprung axle-boxes, and is of the sliding type; maybe, one-piece castings will be made, incorporating both frames and the centre casting, saving still more work. The trailing wheels have radial boxes. The cylinders are 1 $\frac{9}{16}$-in. bore and 1$\frac{5}{8}$-in. stroke, equivalent to the 19 in. by 26 in. of the rebuilt *Great Northern*. I have schemed out a special design for the inside cylinder, easy to machine and fit, and have also something up my sleeve for the steam and exhaust connections. All three cylinders have slide-valves with large ports, and each has a separate valve-gear. The inside cylinder is between the bogie wheels, and there is plenty of room for the valve-gear and a fairly long connecting-rod. Oil is supplied by a twin-pump mechanical lubricator.

Three cylinders of the proportions mentioned need a good boiler to back them up under any condition of working, and I have tried to specify a "kettle" that will do the needful. It is 4$\frac{1}{2}$ in. in diameter at the smoke-box end, and the second coarse tapers out towards the firebox, as in full-size practice, the firebox having ample grate area, properly proportioned to the size of the boiler. It has a combustion chamber with cross tubes. In view of my experiments, as recently mentioned, a high degree of superheating is provided, with return-bend elements. The smokebox is 6 in. in length, and carries a double chimney with two blast-pipes and two blowers; so that when Scotty's daughter applies her persuasive powers to starting a load equivalent to a thousand tons of "live meat," she will remark: "Hoots, come alang wi' ye!" (six beats!) to some purpose. The boiler is fed by an eccentric-driven pump, and an injector same as "Petrolea's," with the usual emergency hand-pump in the tender, the latter being a small edition of the standard L.N.E.R. non-bogie



details

Petrol Engine Topics

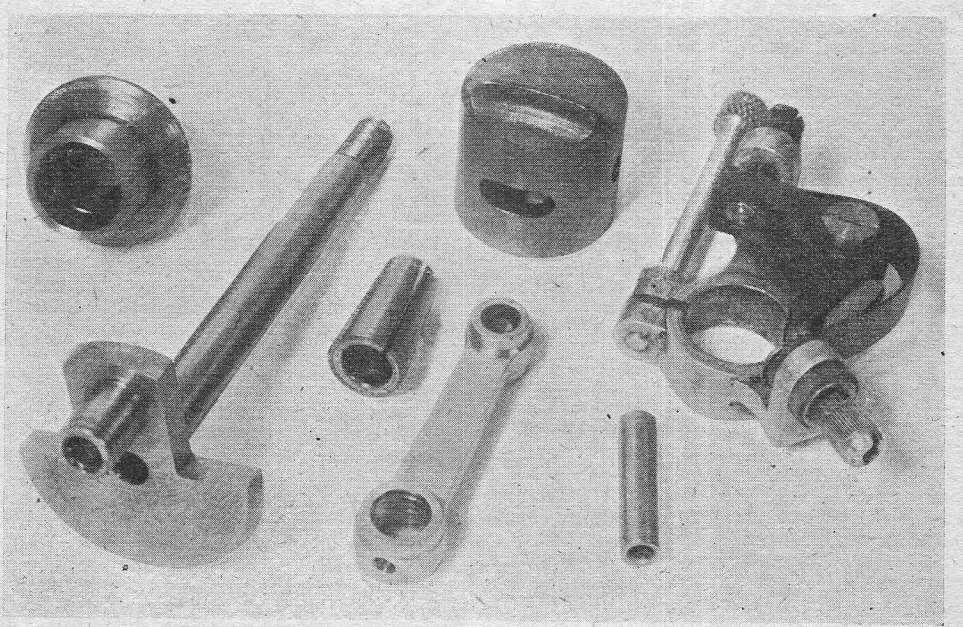
"Repairs and Renovations"

By E. T. WESTBURY

WHEN is a petrol engine worn out? This question is often put to me, but it is one to which no concise or definite answer can be given. The life-span of engines, like that of human beings, is indeterminate, and some engines survive many years of hard work and ill-usage, while others fade away in no time, despite the most careful treatment. Many engines are ruined in the early stages for want of due attention to lubrication and cooling. But an engine which is of sound design in the first place, and has neither been flogged to death nor mutilated by a major breakdown, should be capable of a long, useful working life, and, moreover, when its efficiency has been impaired by the normal processes of wear and tear, it should be possible to restore its vigorous youth by complete and systematic overhaul and re-fitting of its working parts.

In the case of racing engines, their adjustment and tuning is a slow process, and it very often happens that an engine begins to develop its full capabilities only when one might logically expect, from the amount of running it has had, that it would be completely worn out! I know of many successful speed-boat engines which are still going strong, and still improving on past performance, at the sturdy old age of seven or more years. This has been the case with some of my own engines, and, as a general rule, they have all been superseded in design long before any really extensive wear of the working parts has taken place.

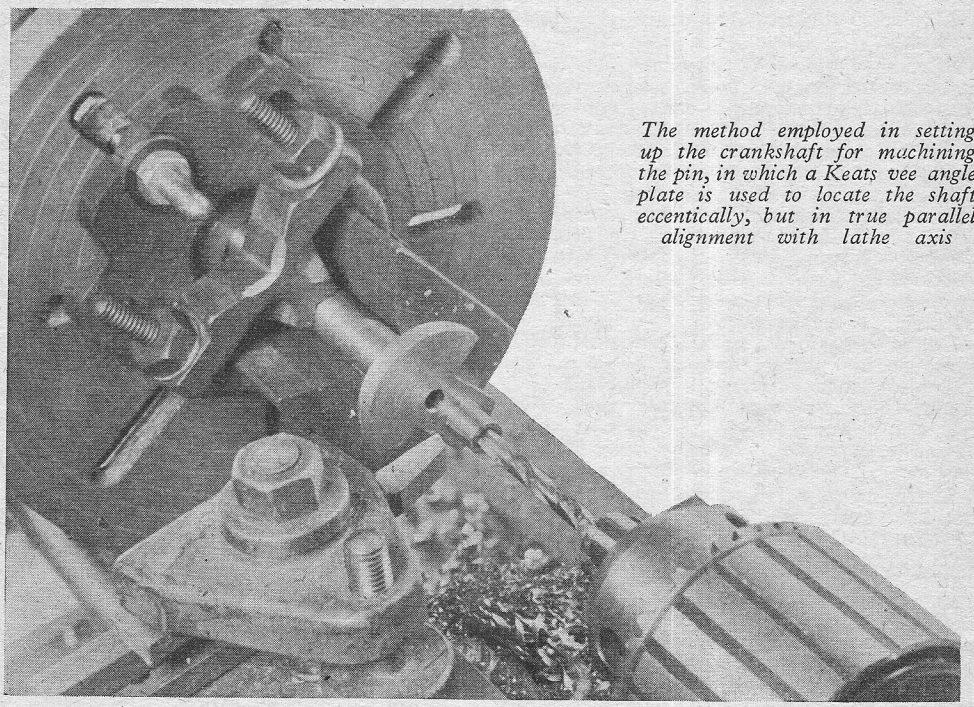
The majority of engines produced by individual constructors nowadays are of robust construction, with liberal bearing surfaces, which not only favours long working life, but also enables them readily to be re-fitted when worn. But many commercially-produced engines are cut down to the point of flimsiness, and have a short working life; one is sometimes inclined to suspect that this feature is "on the blue prints"—in other words, a deliberate policy—on the commonly accepted, but no less fallacious, principle that it is "good for trade" for engines to wear out quickly. Such engines, by reason of their skimped design, are often difficult to renovate, but it is generally possible to do something about this, and even to improve on the original design in respect of wearing properties, by the exercise of a little ingenuity. Whether it is worth while to do this, or whether it is under any circumstances possible to produce a sound and robust engine by these means, is another question, which can only be decided by careful consideration of each individual case.



Some of the new or rebuilt parts used in renovating a small two-stroke engine

dealt with before, and obviously differs in no respect from the job of making a piston for a new engine. In small-capacity two-stroke engines a closely-fitted cast-iron piston is generally preferable to any other type, and this applies, whatever material was initially used for the piston. Unless one is out to experiment, it is advisable to preserve the linear dimensions of the original piston in any two-stroke engine, so that the port timing is not altered, and the shape of the deflector should also be carefully copied.

Other working parts of the engine should be fairly easy to deal with on common-sense lines. Wear on gears and cams of four-stroke engines may necessitate renewing these parts, which may be a difficult business for the novice, but some guidance on these matters is generally forthcoming if one is in a position to consult a few back numbers of THE MODEL ENGINEER, as they have all been dealt with at various times. Moderate wear of these parts will rarely prevent an engine from working fairly well, though it may prevent it from reaching full efficiency, and give rise to a good deal of mechanical noise.



The method employed in setting up the crankshaft for machining the pin, in which a Keats vee angle plate is used to locate the shaft eccentically, but in true parallel alignment with lathe axis

Stripped Threads

Owing to the small size and abnormal strains on the bolts, studs and other threaded parts of model petrol engines, it is quite common to find that some of them have failed to stand up to their job, and have stripped, or pulled out of tapped holes. A stripped thread in an aluminium casting is always a troublesome thing to deal with, and the obvious advice to drill it out and tap it one size larger is not always as easy to carry out as it sounds. In many engines, both the size and the depth of tapping lugs is really inadequate to take threads strong enough for their designed purpose, in which case little can be done about it; but where the amount of metal permits, it is often good practice to drill out the casting well oversize, and fit a brass or steel bush, screwed both externally and internally. Very fine threads in aluminium castings are not generally advisable, especially if the screws have to be removed and replaced in ordinary maintenance.

Cracked or broken castings, or other structural components, are often encountered when renovating an engine, and must be dealt with as the occasion arises. Parts which have to withstand pressure or structural strain can rarely be repaired satisfactorily, and usually replacement is the only safe course. But there are possibilities in the discreet application of brazing or welding methods, and such expedients as the shrinking-on of strengthening collars have often been exploited with great success. Neither brazing nor welding, however, is recommended for the repair of parts made from high-tensile alloy steel. In some cases, elaborate pains are taken to repair a component, more or less satisfactorily, when it would have been much easier to have made an entirely new one.

A Tough Proposition

During recent years, when it had been impossible for readers to obtain new engines, my advice has often been sought on ways and means of putting old ones into working order; but while I have never grudged the time and

The Malden S.M.E. Exhibition

THE many local exhibitions which have been held by model engineering societies all over the country bear witness to the increasing popularity of this pursuit, and the public interest which is taken in its achievements; but, even more so, to the constant improvement in general standards of model engineering craftsmanship and ingenuity. Few of these exhibitions fail to bring to light at least one or two models of outstanding merit, in respect of both workmanship and design, in addition to many examples of good general quality, in which it is extremely difficult to find any grounds for criticism. The task of the judges continually becomes more onerous, for whereas the "weeding out" of a large percentage of entries was nearly always possible in the exhibitions of former years, it is nowadays extremely difficult to find any entries which can be summarily eliminated in this manner, and the comparisons between runners-up for high awards are always a delicate problem.

In these respects, the Malden Exhibition, held on November 23rd and 24th, at the Graham Spicer Hall, New Malden, Surrey, was quite typical, and without making odious comparisons with other events of this nature, it may be fairly stated that both the quality and variety of the exhibits reached a higher level than ever. Seen from the viewpoint of the judges, the most outstanding feature of the exhibition was the way in which the various models of widely diverse class, size and type, ran neck-to-neck in competing for high awards. It may here be mentioned that the policy of the Malden Society is to assess merit irrespective of the type of model, instead of the more usual method of dividing the entries into different competition classes. There is much to be said for this idea—but what a dilemma for the judges!

An innovation at this year's Malden Exhibition was the introduction of the Malden Medal of Merit, a trophy of dignified design, which is to be awarded each year to the entrant whose model shows the highest workmanship in the competition class. Only one medal is awarded each year, either in silver or bronze, according to the standard at which the model is assessed.

The Exhibition was opened by the Mayor of Malden and Coombe, Alderman J. G. Sharp, who, accompanied by the Mayoress, received the welcome of the Society from the President, Mr. G. F. Goodchild. After a tour of inspection, conducted by Mr. Goodchild and the hon. secretary, Mr. Tonnstein, both the Mayor and Mayoress expressed their sincere appreciation of the display of local talent represented in the assembly of exhibits.

Attendance at the exhibition broke all records of previous years; during Saturday afternoon, the crowds became so dense that it was found expedient temporarily to close the doors several times, and a long queue formed outside the building. It became necessary to appeal to the public to move on after seeing the exhibits, to make way for those waiting patiently outside the hall.

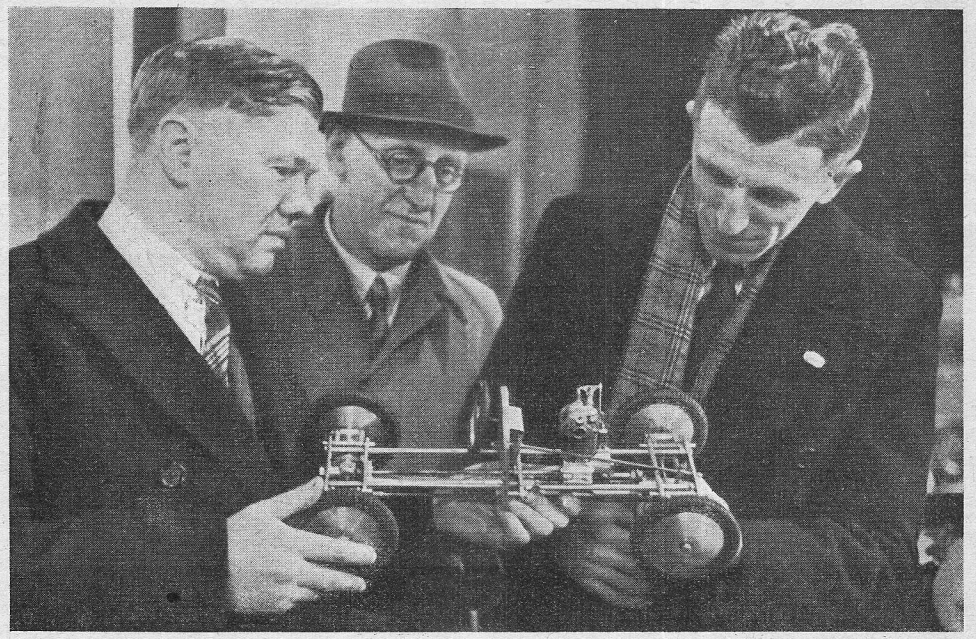
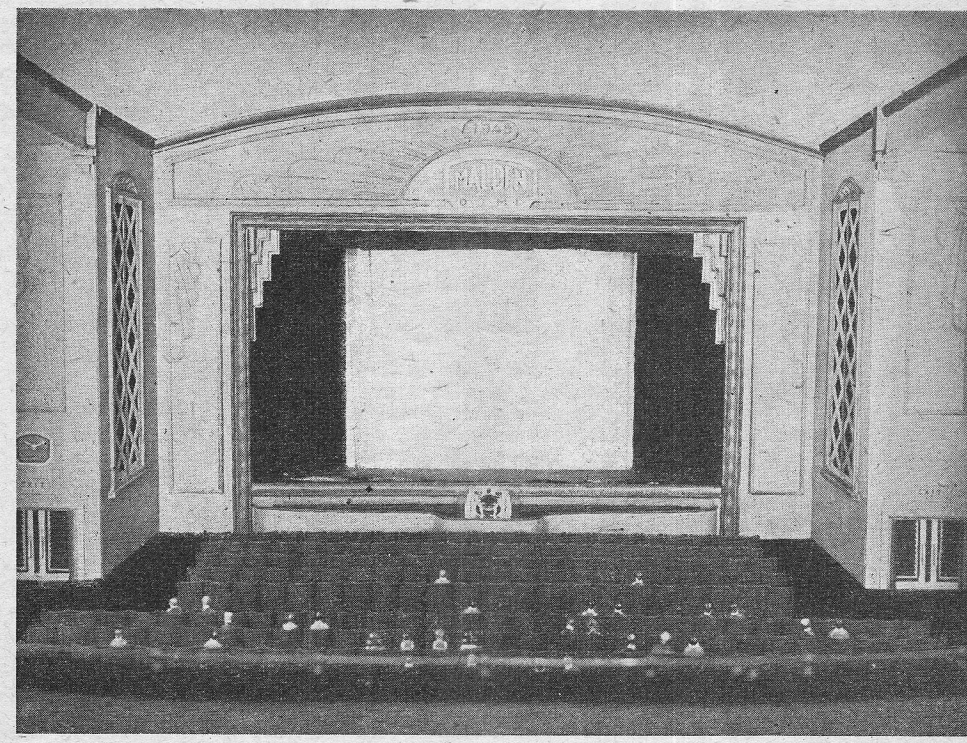


Photo by Courtesy [" *Wimbledon Borough News* "

The many novel and ingenious features of Mr. B. Miles's model racing car chassis arouse the attention of petrol engine enthusiasts

Photo by Courtesy | *"Wimbledon Borough News"*

A young locomotive enthusiast considers the unorthodox features of an old-time American locomotive



One of the special attractions at the Malden Exhibition: the scale model Cinema Theatre, by Messrs. F. Bontor and R. C. Marshall

An Easily and Cheaply Made Bench Drill

By A. T. WILKINSON

SOME few years ago the author had need of a high-speed bench drilling machine as a supplement to the small centre lathe and, not wishing to spend a lot of money, decided to try constructing one himself, using, as far as was practicable, various odds and ends lying around the workshop, and needing the minimum of machining.

With this end in view, search was made for something which could be used as a basis or foundation on which to work, and a steel junction-box, about 4 in. square and 1½ in. deep was discovered. This immediately suggested itself as a possible frame for the spindle, as there were already four ¾-in. holes in it, two of these being in just the right position for the spindle. A piece of ¾-in. seamless steel tube was next found, and careful cleaning up of the junction box holes with a file, enabled this to slide freely without shake. The tube was cut off to a length of 6½ in., and faced in lathe on ends; then two phosphor-bronze bushes, one plain and the other shouldered, were turned and pressed into the tube, the bores being obtained by using a pilot and then a 19/64-in. drill and finished off with a reamer (5/16 in.) in position. The plain bush was used at top and the other at bottom, the shoulder providing a surface for the thrust-washer. I should mention that the 5/16-in. bore for bushes was decided upon as a result of my decision to use a ¼-in. capacity chuck off an unserviceable breast-drill which was tapped 5/16 in. B.S.F. silver steel was decided upon as being the most suitable material from which to construct the spindle, and a piece about 9½ in. long was cut and screw-cut to fit chuck. Two large bolt-heads were then drilled, tapped 5/16-in. B.S.F., and faced true for thrust-washer locknuts, the thrust-washer itself being turned in bronze, ¾ in. diameter and 1/16 in. thick.

That completed the bottom end assembly and attention was turned to the top. Here, some slight difficulty was experienced in devising a method of preventing the spindle dropping out of its tube, as it was not desired either to drill same (for retaining collar and pin) or to screw it, and use nut, the former involving weakening, and the latter, preventing the making of a decent keyway. After some thought, a solution was found. Two flats on spindle and a "C" washer. Quite simple and very effective, the washer being recessed in space between top of bush and top of tube and needing only a few turns of thrust-washer locknuts for spindle to rise sufficiently to remove it. The "C" washer was made from an ordinary ¼-in. M.S. one.

Next, a piece of 1½ in. wide by 1/16 in. thick mild steel was bent into the shape shown in drawing and fastened around top hole of junction box with ¼-in. screws, the underside of vertical part forming a stop for upward travel of tube, and also additional bearing for otherwise unsupported keywayed portion of spindle. The keyway had, of necessity, to be filed by hand (in the absence of a suitable cutter for use in lathe) and this was about the worst part of the whole job. Keyway was 1/16 in. wide and 1/16 in. deep, and extended about 2½ in. The spindle was then hardened.

An old electric motor out of a vacuum cleaner was intended to drive the completed machine, and, to reduce spindle speed, a bevel drive giving a 5-1 reduction, was used; details of it are shown in drawing. The large bevel, taken from the same unserviceable breast-drill which provided the drill chuck, needed no boring, as it was already 5/16 in., and all that was necessary here was to drill and tap a small hole in its boss and reduce a 3/16-in. Whitworth screw on its tip to 1/16 in. square to engage in spindle keyway. The bevel pinion also came from the same source and was sweated to its spindle.

Two ¼-in. B.S.F. studs were then screwed into tube as shown in drawing, and a scrap piece of steel filed into a double fork shape, a ¼ in. hole drilled through it longitudinally and squared by file. A ⅜-in. round M.S. rod was square filed for 1⅞ in. of its length to fit the fork and the extremity of the squared part was reduced to ¼ in. diameter to make a bearing for itself in the ⅛-in. thick M.S. cover-plate, which was attached to open end of junction-box by ¼-in. screws at each corner. This reduced ¼ in. diameter extended along ⅜ in. of the previously-squared part and was screwed ¼-in. B.S.F. for a distance of ¼ in., and a washer, nut and split-pin used to locate fork spindle endwise between integral flange of frame and detachable cover-plate. The total length of this fork spindle was about 2¾ in., the handle end being also reduced to ¼ in. The extreme end was ¼ in. square to take handle boss and a narrow portion, ⅛-in. wide left round for bearing surface in frame flange. The handle and handle boss were quite straightforward turning jobs and are shown clearly on drawing. The material used was M.S. Square in boss was filed. A ⅛ in. screw was used to retain this boss on fork shaft.

A key and keyway were necessary to prevent spindle tube rotating. This detail is also shown on drawing; the material for keyway is aluminium, but this is unimportant, any other metal would have done equally well. A piece of 1½-in. by ⅛ in. mild-steel, 12 in. long was then fastened to junction box frame with screws and attached to bench by 2-in. × 2-in. angle-iron brackets. This left a distance of 6 in. between bottom of drill chuck (with spindle in up positions) and bench. A slot was now formed in this pedestal,

by drilling and filing, 2 in. long, and a ⅜-in. stud, washer and nut used to clamp drilling table to pedestal and to adjust height between table and chuck. Quite a good range of movement was thus obtained, the 2 in. allowed by the slot being increased, of course, by the normal downward movement of chuck spindle, which is also about 2 in. Drilling table was a piece of 4-in. by 2-in. angle-iron and could be tilted for angle drilling.

That, more or less, completed the construction of the drilling machine itself; all that now remained was the drive from the electric motor to the bevel pinion shaft. The motor was mounted on the bench behind the machine, and the drive transmitted by ½ in. wide belt and cone pulleys. These pulleys were turned from aluminium and fixed to their respective shafts by setscrews engaging on filed flats.

The completed assembly has now been in use for more than two years, and has been entirely successful; a ¼-in. hole can be drilled, without a pilot, in a 2 in. thick piece of mild-steel with the greatest of ease, using moderate pressure on handle and low gear of cone pulleys. One modification was carried out, however, and that concerns the lower hole of junction-box in which the tube slides. After about a year's use a certain amount of wear became apparent, although this was not unexpected as, after all, the surface area of this bearing was small, owing to the thinness of the flange. Also, the lower bush and thrust surfaces showed signs of wear; so it was decided to make a new bush which would permit the use of a shrouded ball-thrust, as it was felt that the plain thrust-washer absorbed a considerable amount of power when using heavy pressure on handle. These modifications are shown in one of the drawings and are almost self-explanatory. The combined bush and thrust washer housing was turned, as before, from phosphor-bronze, the thrust washer also being made of this material, while the 1/16-in. steel balls were loose and not caged. The clamp, designed to allow adjustment for wear of tube and lower sliding bearing, was rough-turned from cast-iron, split, drilled, tapped ⅜-in. Whit., contracted slightly with clamping screw and then finish-bored to the exact size of tube and faced true. Two holes were then drilled, one ⅜ in. to locate clamp on junction-box with ⅜ in. Whit. screw, and the other 7/32 in. for clearance. For adjusting, the front screw is slackened off and the clamping screw operated, then front screw retightened.

The whole job took about twenty-four actual working hours, and nothing whatever was bought from outside sources, with the exception of the belting.

Letters

Conjugated Valve Gears

DEAR SIR,—I would like to thank Mr. P. C. Cooper for his letter published in THE MODEL ENGINEER of January 3rd, 1946. I note with interest the information contained therein.

I was certainly unaware that the "Holcroft" gear was no longer is use; the information Mr. Cooper gives relating to it tends to confirm my contention anent separate gears for each cylinder in a three-cylinder job being the better proposition than a conjugation.

Regarding the 90-degree crank setting "Lord Nelson" class engine, No. 865, I imagine that, as the four sets of valve-gear originally existed when the change in crank-setting was made, it was a much more economical proposition to retain them than it would have been to design and make a set of conjugation levers, links and pivots. Direct *factual* information of the nature of that given by Mr. Cooper is always of value and interest.

Yours faithfully,

Harrow. K. N. HARRIS.

Interesting Old Micrometer

DEAR SIR,—Mr. White's article on this instrument was very interesting, but I cannot agree that it is unusual.

This type of micrometer has been made for many years by Brown and Sharpe, for bench use and is illustrated on page 74 of their catalogue, No. 33A, 1938. This illustration shows an instrument almost exactly identical with Mr. White's, but the measuring screw has 50 threads per inch, the instrument reading to 1/10,000 of 1 in.

I am informed that such instruments were quite common in local tinworks for checking the thickness of sheets.

Yours faithfully,

Neath. H. J. DUPONT, A.M.I.B.E., M.R.S.I.

Are We in a Groove?

DEAR SIR,—Your query in a recent issue of THE MODEL ENGINEER as to whether we have got into a groove in the making of certain types of model engines, I am inclined to think that in *some instances* we have; but, in fairness to THE MODEL ENGINEER, and its contributors, it is by no means *wholly so*.

Have not we access to Mr. Westbury and his enlightened articles on the I.C. type of engine? Also, our model racing-cars and aeroplanes, subject matter that has not just been thought up over night, but rather planned long in advance and which reflects foresight on the part of the editorial staff of THE MODEL ENGINEER.

Whilst I, personally, am not exactly keen on speed-boats, or on I.C. engines, others are. I still adhere to the novelty of a sternwheeler, slow working engine but *fast moving vessel* with everything in sight, straightforward and simple, and which to my mind would be something new to many model engineers and extremely interesting to make, with the added joy of seeing it reeling off the knots.

As to steam engines in general, I would like to see THE MODEL ENGINEER get out plans for a really good *horizontal* steam engine large enough to permit of scale-size governors and fittings.

Yours faithfully,

Ohio. P. W. WILSON.

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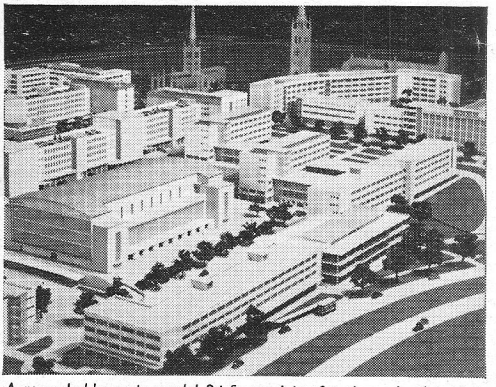

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Ship Modellers' Corner

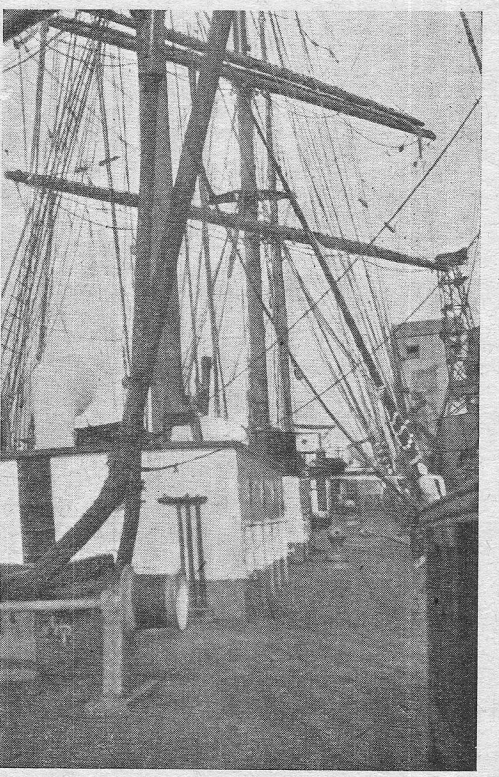
By EDWARD BOWNESS

Describing, with the aid of photographs, some of the deck details now in hand for the model 4-mast barque, "Archibald Russell"

IN the view looking aft along the port side of the main deck, the drum of the winch at the fore-hatch is shown in the foreground. The corresponding drum on the winch at the donkey engine can just be made out, and from their appearance it would seem that a flat belt had been used on them. The guide pulleys for the rope used in the earlier system may be seen on the corners of the seamen's house. I am not sure of the function of the uprights spaced along the sides of this house, and would be pleased if some of our readers could enlighten me. The large pipes leading down to the fore-hatch are suction pipes for unloading the grain, and do not belong to the ship. The erection on the extreme right of the picture is the hen coop or the pigsty. This has occupied various positions during the career of the ship. The rack for belaying pins will be noticed, as also will the steps leading to the roof of the seamen's house.

In the view taken looking forward from the main hatch, the boiler casing and the water tank will be seen on the roof of the midship house. The skids for the boats and the chocks for the cutter on the starboard side are also to be seen. The gig has been put overside from the chocks on the port side. The construction of the flying bridge can be gathered from the portion here shown, and also the single pillar alongside the hatch. The folding doors protecting the main winch, and the drums at each end of its shaft, are plainly shown.

Another photograph shows a view of the poop taken from the corner of the roof of the half deck. On the left one may see the chocks for the lifeboats with their connecting platform, also the gripes for securing the boat. In the centre one can just make out the row of fire buckets, six on each side of the control platform, placed in a rack at the foot of the pillars for the railing. Another view of these may be seen in the photograph of the break of the poop, on page 75 of the issue for July 26th last. On the extreme right the hinge for lifting up the flying bridge may be seen, also the attachment of the rope to the hand-rail. Aft of it is the standard compass, and still farther aft, the base of the jigger mast with its spider band and the cleats for the brails of the spanker.



The main deck, looking aft, port side

Forecastle Fittings

The railing along the after edge of the fo'c'sle head is similar to that at the break of the poop and, as will be seen from the plan, Fig. 13, on page 545 of the issue for June 7th last, its length is equal to the space between the companion ladders. The bell underneath it has been described already, see Fig. 36, November 15th issue. The remainder of the railings should be added after the lower masts are erected, and the forestay fitted. The bollards are similar to those on the main deck. Two smaller pairs are situated just inside the rails as shown on the plan, Fig. 13. The short rail for belaying pins is similar to the fife rails, and the method described for making them should be used here. The skylight and the capstan have been described already. When discussing capstans recently, with one of our Ship Model Club members, Mr. Tilley, he explained to me the method he has employed for fixing the whelps on the barrel of the capstan for a model cabin cruiser which he is making. This was to bind a length of fine brass wire axially along the capstan, taking it a sufficient number of times around to suit the number of whelps required, see A, Fig. 47. The wire is then pressed in close to the "waist" of the

capstan (see B) and the whole dipped into a bath of solder. The larger diameters marked A, on Fig. 47C, are then finished in the lathe, cutting away the wire and leaving the lengths representing the whelps securely soldered in position. The capstan he showed me certainly proved the soundness of the scheme.

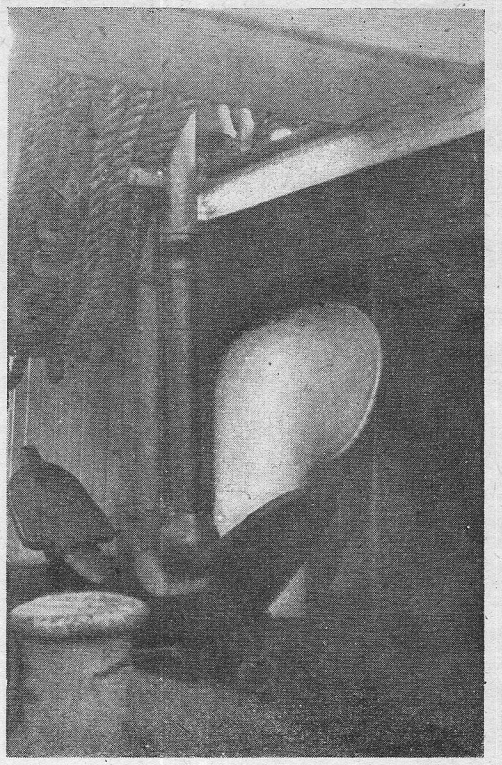
Lighthouses

These can be turned from brass or hard wood, the height above deck being $\frac{1}{4}$ in., and the diameter at the base $\frac{1}{16}$ in. The shape is shown in Fig. 13, mentioned above. They should have a stem turned on the base for fitting into holes which must be drilled on each side of the deck in the appropriate places. If made of wood a small slit should be cut on the forward side of each and a strip of tin inserted to represent the reflector. If the lighthouses are made of brass these strips can be soldered in position. The llghthouses are painted white, and the reflectors red for the port side and green for the starboard. A glass bead could be inserted in the lighthouse alongside the reflector to represent the lamp.

Anchors

There are two anchors on the fo'c'sle head and a spare one at the break of the fo'c'sle. Their size may be taken from the plan, Fig. 13, and their general shape, of the flukes, at least, from the photograph of the spare anchor reproduced in this issue. In this photograph the stock is seen lashed to the shank of the anchor. The ball on the upper end of the stock, not seen in the photograph, is screwed on. When fitting the stock the ball is screwed off and the stock is then pushed through the eye in the shank and secured in position against its shoulder by the cotter seen in the photograph. The anchor rests on a shaped wooden block and is secured by chains to eyebolts in the deck. How much of this is reproduced in the model depends on the skill and patience of the modeller.

The anchors on the fo'c'sle head may have their stocks in position ready for use, especially if the model is shown without sails. Otherwise they may be lashed on the fo'c'sle head alongside the shanks of the anchors, which was the usual position for them when at sea. In the model the stocks will be about $\frac{5}{8}$ in. long. The band around the middle of the shank was fitted with a shackle for use when getting the anchor inboard. The anchor may be cut out of metal or even Perspex. The palms of the flukes will be about $\frac{1}{8}$ in. long by 3/32 in. wide, and should be soldered or cemented in position. In large anchors the ring at the head of the shank was often replaced by a shackle secured with a pin through the shank.



Spare anchor at break of fo'c'sle

Catheads

These should be made of wire or hardwood—split bamboo is very suitable—about $\frac{1}{16}$-in. square. They slope outwards and upward, and their position may be taken from the plan, Fig. 13. The inner end of each should be rounded to fit into holes drilled in the sides of the hull. If they are pushed into the holes with Durofix the surplus expelled from the hole can be formed into a fillet under the catheads.

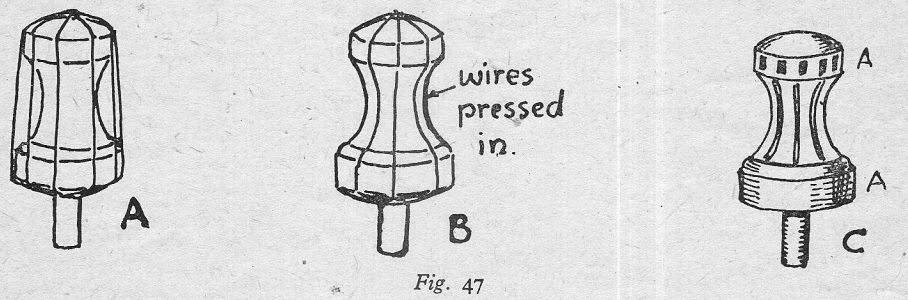


Fig. 47

scriber (slightly *smaller* than the diameter of the pin being used), push the pin in as far as it will go, and then cover it with a brass-tube jig, cut to the length it is desired to have the pin projecting, tapping the pin down with a hammer until the tube prevents any further progress. After removing the jig the pin will be found to be quite rigid, and it is a very simple matter to put a spot of solder at its base.

Two lifeboats were made up from sheet-metal cut to shape of (*b*) and bent to the shape shown in (*c*), Fig. 1, with a blob of solder dropped on to each end. The boat is covered by a piece of metal cut to the shape of the top and lightly soldered. Next, a pin-drill was run through the lifeboat cover and the bottom of the boat in two places, and ordinary paper-clips bent to the shape of davits inserted through the holes and soldered into place.

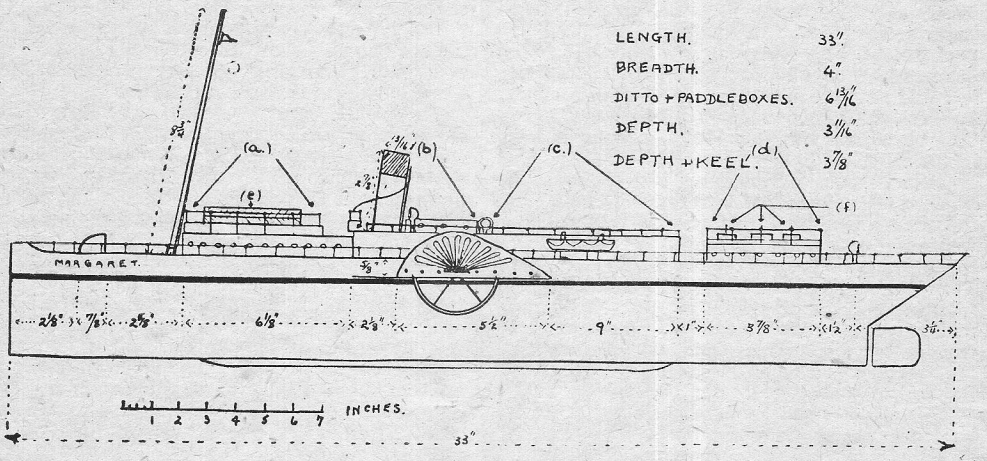


Fig. 4

Ventilators were made from brass tube soldered into old-fashioned cup drawing pins (which I was fortunate to find on sale in Leather Lane) from which the points were first removed, each ventilator being firmly soldered to the deck.

The bridge consists of a piece of brass plate 3½ in. × ⅝ in. soldered to two other brass strips bent to support it, and the latter soldered to the upper deck. So far, only an engine telegraph has been fitted on the bridge ; it is made from two pieces of brass rod soldered together at right-angles with a pin pushed through and bent up at each end to form handles.

The rudder was cut from brass sheet soldered to a piece of brass rod and the latter run through a tube which is soldered to deck and hull. The top of the rudder terminates in a piece of clock-gear cut in half, forming a quadrant, with teeth into which a small piece of strip can be slid, making an immovable setting of the rudder for any position desired.

The mast is an old brush handle (artist's variety), and the only attention necessary was to shave off a little from the base to allow a taper-fit into a brass rod soldered in the foredeck, central, and inclined at the same angle as the funnel. The funnel was fashioned from a piece of tinned sheet-iron wrapped round a brass tube of the required diameter, soldered down the seam, and then adding a very thin copper tube for the siren. The funnel is firmly soldered to the hinged deck, over the exhaust.

Finally, the boat was given a thorough clean with sandpaper and painted, colours being :—

Hull, black below red waterline, white above. Bridge floor, cabin walls, inside of hatches (except fore and stern), passenger seats, brown. Paddle-wheels, red. Decks and sponsons, cream. Paddle-boxes, similar, only slightly darker. Funnel, lifeboats and outsides of ventilators, white (the funnel has a deep blue band). Rails, white. Small hatch in front, brown. Rudder, white. Inside of ventilators, red. A few scrolls and shield on funnel picked out in gold.

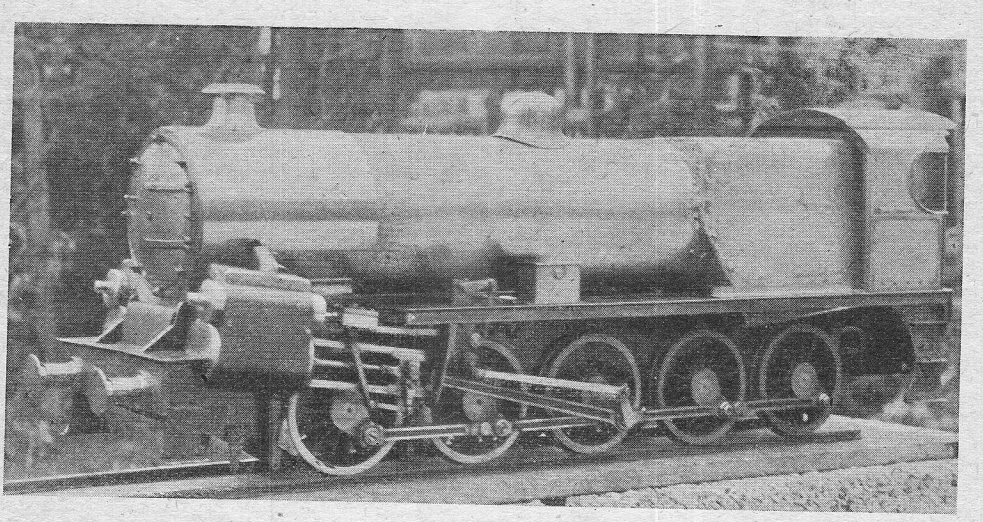
We now wanted a name ; and here my young daughter, aged 3½ years, who had helped Daddy all the way through by pinching tools, picking up hot parts (and thereafter regarding everything with the deepest suspicion), and generally getting me in a tangle, came to the rescue. She was asked, and solemnly named the boat after herself. It was built for her, and the *Margaret* it became.

We were now ready for actual pond trials again, and once there, steam was raised and the *Margaret* launched. One or two false starts requiring drip-feed adjustment were needed ; then she settled down to it, and steamed non-stop for 30 minutes. A number of boys on the bank (none of whom was under 40 years of age) waxed highly enthusiastic. One, who stood apart from the others, disgraced himself by enquiring, in spite of the exhaust steam coming from the funnel, if the motive power was electricity ! Two more runs of half-an-hour's duration were made before lunch, when a break was held for refreshment.

It did not seem that anything more would require to be done ; but it is really wonderful how difficulties wait just round the corner completely hidden, letting you think everything is plain sailing, and then at the most unexpected

A Little "Big Emma"

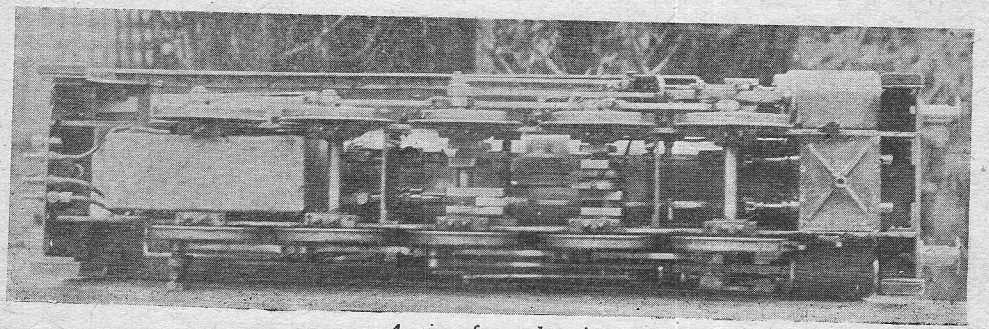
By H. C. ROBINSON



MUCH has been published and said in this journal and on the wireless about the famous Lickey Incline, with its 1-in-37½ gradient, but with the much-regretted absence of "Big Emma" on these occasions.

I think it will be of interest to fellow readers of THE MODEL ENGINEER, if I give a brief description of a ¾-in. scale model I am at present constructing of this famous "old lady." This model, by the way, is nearing completion. I first turned my attention to this locomotive about two and a half years ago, when I was looking for a model which would be really powerful, but which would not break away, to any great extent, from British locomotive practice; also one that would be a welcome change to the everlasting 4-6-2, 2-8-0 and 2-8-2 of stock design. The prototype of my model is a four-cylinder simple 0-10-0, with outside Walschaerts valve gear, with, of course, the steep incline of "1-in-7" to the cylinders which is a notable characteristic of L.M.S. locomotives of this period, and what must have been a rather large boiler for 1920.

There are several items of interest about "Big Emma" which should appeal to model engineers. For example, four cylinders controlled by two outside admission piston valves, with, of course, cross connected ports, two crank axles, or one which is cranked to clear the inside connecting rods, equalised laminated springing throughout the entire coupled wheelbase, also a hand brake as well as a steam brake on the engine. By the way, I am not a "locomotive man," so if my description does not read professionally, I beg forgiveness. I prepared a set of drawings which I "scaled down" from postcards, magazines, and whatever infor-



A view from the pit

of the foundation ring only just shows below the footplate edging. The firebox will be fitted with a combustion-chamber with four vertical water tubes ¾ in. diameter. It will also be provided with a four element superheater. I shall fit a slide-valve regulator in the dome, as there is plenty of head room. I have not yet decided whether to fit top feeds or not, the prototype has them on the backhead.

In conclusion, I might add that all the hexagon headed nuts and bolts in this model—there are quite a good number, ranging from 10 B.A. to 6 B.A.—were made up from hand-filed hexagon stock, the method adopted being the old-fashioned way of using the three-jaw chuck as a dividing head. This may sound very crude to some of you, but, believe me, it is a very quick and effective way of getting what you want without any fuss or bother. While I am on this subject, I might add that this particular branch of model engineering also includes tap- and die-making; practically all mine are home-made. I have built four locomotives in four and a half years of war-work, including Home Guard and Fire Watching, so I don't think the taps and dies owe me much. I don't in any way advocate making your own screwing tackle, but I will say it is mighty useful when you break that special thread, tap or die, just when you are in the middle of some special job, or maybe during the week-end when the shops are closed.

For the Bookshelf

The "Paget" Locomotive, by James Clayton, M.B.E., M.I.Mech.E. (London: *The Railway Gazette*, 33, Tothill Street, S.W.1). Price 2s. 0d.

This is a 12-page brochure containing a reprint, from *The Railway Gazette*, of one of the most important contributions to locomotive history. From time to time during the last forty years, a few unorthodox steam locomotives have been designed, though not all were built. However, one that reached a stage of completion sufficient to enable it to be subjected to a series of steam trials is the subject of the brochure under review. It was a massive 8-cylinder 2-6-2 tender engine of not displeasing appearance; and, had it been permitted to emerge beyond the "teething trouble" stage, it might have influenced the whole subsequent trend of steam locomotive development. Circumstances ruled otherwise; with the result that this remarkable locomotive, its design and performance remained, for many years, enveloped in a cloak of the strictest secrecy; no information about it whatever was allowed to leak out. Yet, the engine itself remained, for many years, stored in a remote corner of the paint shop at the Derby Works of the Midland Railway, covered with tarpaulins, forlorn, neglected and a pathetic memento of the ingenuity and enterprise of its designer, Sir Cecil Paget, who also bore the expense of its construction.

In 1925, the late E. L. Ahrons published a photograph and brief description of this engine, and we believe that this laudable attempt to break down the barrier of secrecy caused dismay and displeasure at Derby.

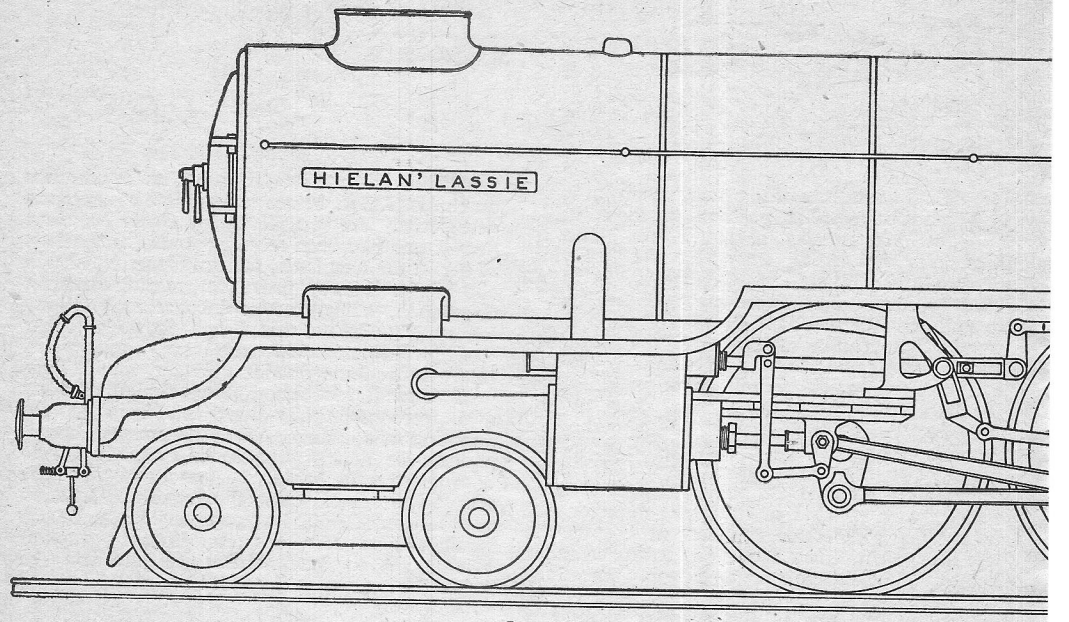
Now, twenty years later, and owing to the sympathetic interest of the late Chief Mechanical Engineer of the L.M.S.R., Mr. C. E. Fairburn, a complete description of this epoch-making locomotive has been published, and is reprinted in this brochure. Mr. James Clayton, who has lately retired from the position of Personal Assistant to the C.M.E. of the Southern Railway, was at Derby forty years ago, and was closely associated with the preparation of the original drawings of the "Paget" locomotive; his description of the engine, accompanied by excellent reproductions of several of the principal drawings, cannot fail to arouse the keen interest of all who follow the history of locomotive development.

Early in 1945, there was published in *The Journal of the Stephenson Locomotive Society* an article by Mr. Kenneth H. Leech, giving some first-hand recollections of Sir Cecil Paget, together with additional information about the engine. This article is included as a kind of supplement to Mr. Clayton's story, and adds much to the value and interest of the whole account. No library of locomotive history should be without a copy of this all-important brochure.

Locomotives of Sir Nigel Gresley, by O. S. Nock (London: The Railway Publishing Co. Ltd., 33, Tothill Street, S.W.1). Price 10s. 6d. net.

In *The Railway Magazine*, during 1941-1943, Mr. Nock contributed a long series of articles describing the many different types and classes of locomotives provided by Sir Nigel Gresley, first for the Great Northern Railway, and, later, for the London and North Eastern Railway. These articles have been revised and added to, and are now presented in one 180-page volume. Mr. Nock's style of writing makes his story thoroughly enjoyable to read, though he does not allow his obvious enthusiasm for his subject to over-ride the interests of accuracy. The book is profusely illustrated by photographs, to which the stout, art-surface paper does full justice; some of the express-train pictures are really impressive.

That Gresley was one of the most outstanding members of his profession, no serious student of locomotive engineering can deny; his name will endure just as long as railway history endures in the future. And Mr. Nock's brightly-written survey will play its part in ensuring a proper understanding of the work of a great man.

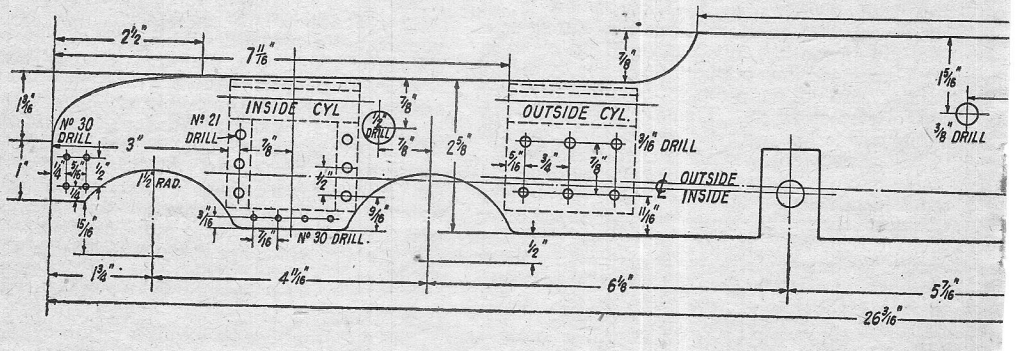


General arrangement of 3½-in. gauge L.N.E.R. 4-6-2

requests as to whether slide-valves could be used on the tank engine "P. V. Baker," and prospective "Hielan' Lassie" builders begged me to specify slide-valves for her, that I substituted the slides in deference to wishes. Now this entails a lowering of the whole gear layout, to suit the lower position of the connection of the radius-rod to the combination lever; and I saw at a glance that there would be no room for the reversing-shaft and arms between the coupled wheels. At first I thought of using a reverse-shaft high up under the running board, and lifting and lowering the radius-rods by drop links; but there would have been an immediate outcry from friends and relations of Inspector Meticulous, so I abandoned the idea, and substituted knee-type fork joints on the valve-spindles, which allowed the gear to be placed high enough to accommodate the regulation pattern of reversing-shaft and arms between the wheels. If I built one of the engines myself, it would have Baker gear.

Brief Specification

Generally speaking, "Hielan' Lassie" conforms to Mr. Thompson's latest practice on the L.N.E.R., the only variations being those necessary for a sound substantial job on 3½-in. gauge, to ensure a hard-working and very powerful engine of guaranteed efficiency. The main frames are ⅛-in. steel plate, and of great depth over the coupled wheels, thus enabling them to stand up to the turning effort of three hefty cylinders without any distortion, and needing little in the way of staying. The same material can be used for the trailing cradle if desired, although castings will be available for those desiring same; the use of these will considerably reduce the work in erecting. A new type of L.N.E.R. hornblock will be used. The bogie



eight-wheeler which is supplied to all the Pacifics on that system. I am only specifying the necessary trimmings for a locomotive intended for hard work; but "extras" such as steam brake, vacuum ejector, electric lighting, and other *de-luxe* accessories, can all be applied to taste, and I will, all being well, go into details of these and any other desired fitments when the main part of the instructions are through. Final warning—I'm on the "grapevine telegraph," as you know, and information has reached me that various "casting pirates" and suchlike folk, realising that this engine will be popular, are out to make all they can out of it; so be careful that you get your supplies from known and reliable sources—enough said!

Main Frames

Two pieces of $\frac{1}{8}$-in. mild steel plate, $26\frac{1}{4}$ in. long and $3\frac{1}{2}$ in. wide, will be needed for the main frames. They are very easy to cut out, being nearly all straight lines. Mark one out, then drill a couple of the screw-holes, and rivet the plates together temporarily. Don't forget, when sawing long straight lines, that the tops of the vice jaws make an excellent guide for a hacksaw laid on its side, or put in the frame crosswise; and a drop of the same cutting oil used for turning steel, or even soapy water, is a wonderful help in getting the saw through the metal and prolonging the life of the blade. As some folk are prone to get in trouble in finding the centre from which to strike the arcs for the cut-away parts of the frame over the bogie wheels, I have shown them; they are $\frac{1}{2}$ in. below the bottom of frame, at the intersection of the wheel centre-lines.

The positions of the principal screw-holes are indicated in the drawing. The four at the extreme front are for attaching the buffer beam, and their exact position doesn't matter, so long as they allow the screws to enter the angles on the buffer beam. Same applies to the four along the bottom of the frame between the bogie wheels; these are for the screws holding the bogie bolster. The cylinder bolt holes should be correct to drawing, and the best way of ensuring this is to mark out the position of the cylinders as given by the dotted lines. The front of the inside cylinder casting will be 3 in. from the front edge of frame, and the front of the outside cylinder will be $7\frac{11}{16}$ in. from the same point; see illustration. The cylinder castings will be finished to a length of $2\frac{3}{16}$ in., and the combined height of bolting face or flanges, steam chest, and cover, also tot up to $2\frac{3}{16}$ in.; so, to get the correct location, all you have to do is to draw out two $2\frac{3}{16}$ in. squares, with their top corners at the distances mentioned above, and 1/32 in. from the top line of frame. The inclination is very slight, being one degree only. The centre of the bore of the inside cylinder is 29/32 in. above bottom of frame, and the centre of the bore of the outside cylinder is 27/32 in. above bottom of frame. Once you have set the two squares in correct position, setting out the screwholes is as easy as eating a piece of cake.

The big hole close to the inside cylinder is where the exhaust pipe from the outside cylinder passes through, and is $\frac{1}{2}$ in. in diameter. The $\frac{5}{8}$-in. hole which is located between the first and second coupled axles is for the bush in which the reverse shaft works; the exact location of this is important. The three holes just ahead of the rear coupled axle are for the screws holding the stay for the eccentric-driven pump, which points forward and is driven off the middle axle. The daffy of holes behind the rear coupled axle are for the screws attaching the main frames to the trailing cradle. They should be countersunk. Don't get confused over the shape of the rear end of the main frames, and mix up the lines with the cradle; they finish $2\frac{3}{4}$ in. behind the rear coupled axle centre, and the vertical part is $1\frac{5}{8}$ in. high. From there, the frames slope $1\frac{1}{16}$ in. towards the front.

There is no need for me to go into full details again as to *how* to mark out the frames and cut them to outline; I gave all that in the notes on "Petrolea." For new readers' benefit I will briefly repeat that if bright mild steel is used for the frames, it should be coated with a fluid made by dissolving shellac in methylated spirit and adding a little colouring dye. This dries in a minute or so, and scriber marks show up silvery-bright in it. If blue steel is used, the natural colour of the metal suffices if a hard scriber point is used to mark the lines. Anybody who has, or can get, the use of a milling machine and a 3-in. diameter cutter $\frac{5}{16}$ in. or more in width, can form the openings for the bogie wheels in a jiffy, by clamping the frames in the machine vice on the miller table, and feeding the whole bag of tricks straight up into the cutter, using slow speed and plenty of cutting oil. Saves a dickens of a lot of filing! Having a good hefty milling machine and a selection of cutters of various diameters and thicknesses. I usually finish off curved openings in any engine I happen to be building, in a similar way; but to avoid reducing a large bulk of metal to "mincemeat," I cut the frames roughly to shape with a "Lilliput" cutting blowpipe first. This little gadget walks through steel at an amazing rate, cutting 3/32 in. sheet at the rate of a yard a minute; goes around any corner, and leaves a cut as clean as that left by a hacksaw. If all goes well, they will soon be "home-made" and on sale at a reasonable rate in this country. The rectangular openings for the hornblocks can be made by drilling a few holes below the horizontal lines, sawing down the vertical ones, breaking out the pieces, and finishing sides and ends with a file, or milling them. Use a piece of 1-in. by $\frac{1}{4}$-in. steel or brass bar as a gauge.

The above should keep builders busy for a week or so, and next week I propose to deal with trailing cradle, buffer and drag beams, bogie bolster, and erection of frame; meanwhile, I want to ask a favour. Should an obvious error creep into either drawings or notes, please call my attention to it by a friendly note, and I will greatly appreciate your assistance. I do my utmost to avoid any mistake, but the passing of the years, especially the last six, makes the job more difficult; and it has been my policy all through life to face facts. I shall never forget the circumstances under which I schemed out the valve-gear for "Petrolea," even if I survived to the reputed age of Methuselah!

I am often called upon to advise on the repair or complete reconstruction of second-hand engines, which, in most cases, have been acquired by the querists in various ways, and with little knowledge of their previous history. This is always a great disadvantage, as one has no means of knowing whether the engines have ever been, or could ever be, satisfactory in performance. Many dealings in second-hand goods are like buying a pig in a poke, but model petrol engines are especially difficult in this respect, as the most minute inspection may often fail to reveal their secret faults. But there are usually some clues present which may be read by the initiated, and one can judge by the workmanship put into an engine, particularly in the small details, what the general chances are that it has once been a successful engine.

Sometimes an opportunity arises to acquire an engine with a known and more or less creditable history. Members of model engineering societies sometimes pick up a windfall of this nature through that grand old British institution, the annual "jumble sale"; and in such cases they have the advantage of knowing that if the purely mechanical parts of the engine can be restored to their original condition of fit and finish, it will serve the new owner as faithfully as it did the old. Beginners who lack confidence in their abilities, or the adequacy of their equipment, to produce an engine throughout, often obtain an introduction to the mysteries of petrol engines in this way, and I am of the opinion that it is a more satisfactory and satisfying way than purchasing a brand new engine, whether of the commercially-produced type or otherwise.

Having obtained such an engine, the next thing to consider is how to carry out the operations involved in the rejuvenation process. A systematic examination of the engine is the first thing to consider, including a check-up of all dimensions, alignments and so on, wherever possible. For this purpose the engine should be completely dismantled, and the greatest care should be taken to find exactly how each part is fitted, and memorise its position and function in the complete assembly. Avoid undue force in detaching any of the parts; the use of tin-openers and "'eavy 'ammers" is obviously taboo! One may possibly be led up the garden by left-hand threads (personally, I rarely use them anywhere), and I know of many cases where attempting to dismantle an unknown engine by the exercise of sheer brute force (together with its colloquial corollary) has resulted in "writing it off" completely! Taper-fitted flywheels or gears may call for some kind of extractor device for their removal, and one should never grudge the time taken to make these appliances, as they are sure to save much more time later on. Each part should be examined with the most scrupulous care, using a lens to search for cracks, flaws, signs of distortion, or hard wearing spots; the fit of each working part checked, and shaft journals, etc., measured all over, with a micrometer, if available, to detect errors in roundness or parallelism.

Points Requiring Attention

In any engine which has had a fairly considerable amount of wear, it is almost a certainty that at least the major working parts will require attention. The shaft bushes or races will most likely have to be renewed, and the cylinder re-bored or re-lapped to take a new piston. It should be remembered that if heavy wear of the bearing bushes is detected, there is more than a likelihood that the shaft will be worn oval, or otherwise irregularly, as well; and to attempt to fit such a shaft in new bushes without correction is like putting old wine in new bottles. The amount of wear on the shaft may be too small to justify re-machining, and in any case the reduction of its diameter thus caused is generally undesirable. Cylindrical grinding is the ideal method of correction, but is often beyond the facilities of the amateur; in which case, an equally satisfactory, though much slower, method is to lap the shaft with a split ring lap of copper or other soft metal. This, if exercised with due care and patience, will correct errors of parallelism and roundness, but is of no avail for dealing with a bent shaft, so any attention necessary in this respect should be given before lapping.

The crankpin will also probably require to be corrected in similar fashion, but here again, it should be noted that any error in the alignment of the pin with the journal will call for separate treatment. If the pin has been run direct in the eye of the connecting rod, without bushing, it may be found rather difficult to bore out the eye to take a bush, in which case it is often less troublesome and more satisfactory to make an entirely new rod. The old rod may be bent, distorted or fatigued, anyhow, and its renewal is generally a prudent policy.

In engines fitted with ball races, it is generally only necessary to remove the old races and fit new ones, but great care should be observed to avoid damaging or distorting the seatings in both operations, and to ensure that the races are kept perfectly square with the shaft axis. Sometimes the shaft housings are found to be a sloppy fit, due to hammering or creeping of the races, in which case they should be bored out and bushed, making sure that true concentric alignment is duly preserved. *Don't* try to take up the slack by wrapping a strip of foil round the race; that might possibly work in some kinds of mechanisms, but is asking for trouble in model petrol engines!

The operation of lapping a petrol engine cylinder has been fully dealt with on more than one occasion in the past, so there is no need to say much about it here. There is little difference between the procedure on either a new or an old cylinder, except that the latter is liable to be more inaccurate, and may vary in surface hardness, some patches being very hard indeed, so a sharp, fast-cutting abrasive should be used for the first stage of lapping.

Incidentally, there are many users of model petrol engines, including myself, who believe that an old cylinder, after being re-lapped, is better than a new one, because the metal will have arrived at a stable condition, its initial distortion and "growth" having been completed, so that no further distortion is likely.

If no suitable piston casting for the engine is available, it will be necessary to machine one from the solid. This operation has also been

trouble taken in investigating individual problems of this nature, I have been obliged to draw the line on the many occasions when querists have subsequently invited me to put my own precepts into practice, and undertake the job of reconstruction myself! Believe me, if I accepted half the commissions for repair work alone—to say nothing of tuning, redesigning, or entire construction—which are submitted to me, I should never have time to carry out any of my own work, or write about it either! But occasionally, in an unguarded moment, I do get inveigled into taking on a job of this kind; it generally takes up a lot of time which I can ill afford, and is rarely profitable from the point of view of results achieved in relation to trouble taken, but it does at least keep me in touch with other people's problems, and adds something to my treasured hoard of practical experience.

Some time ago, a friend of mine, to whom I considered myself under some personal obligation, requested me to examine an engine which was suffering from those all too common maladies, catalepsy and total paralysis. On dismantling the engine, any mystery as to why it wouldn't go was effectively dispelled—there was enough wrong with it to stop a tank, let alone a poor little two-stroke! In fact, the number of glaring errors, in both design and workmanship, which that engine contained, gave it full qualification to serve as the "Horrible Example" of all the vices.

On the principle of "no names, no pack drill," I refrain from mentioning the origin of the engine, or from publishing a photograph of it either before or after reconstruction. But among just a few of the things in it which obviously were not in keeping with the best practice, may be listed the following:

The cylinder, which was of cast iron, had an internal surface which was neither accurate nor even reasonably smooth. Ports were formed by drilling, little regard apparently having been paid to their correct location, and in one or two cases holes had run into one another. A pressed-steel piston was fitted, which touched the cylinder in at least three places; the gudgeon pin "bosses" consisted merely of burrs pushed in the sides of the piston by a punch, and the gudgeon pin was made of *brass* rod. On the top of the piston was an ugly excrescence, no doubt intended to act as a deflector, and probably also formed by pressing, though it looked more as if the constructor had gone berserk and attacked it with a very knobbly coke hammer! A mere trifle in the piston design was that it was made shorter than the engine stroke, so that all ports were opened at *both* ends of the stroke.

The crankshaft was apparantly made from a forging, or possibly a malleable casting, with so suspicion of a balance weight. When the journal was machined, the turner evidently had a beautiful "dig-in" at the shoulder of the web, producing an undercut just at the point where maximum strength is most essential. A cast gunmetal connecting rod was fitted, the pristine beauty of which—straight from the moulding shop, after fettling with a 14-in. rough file—was further embellished by a bend in the shank, presumably put in to adjust port timing!

A radially finned aluminium head was fitted, the cooling surface of which was reasonably adequate, but the joint flange was so thin that, in spite of being held down with eight screws, and having a gasket of 1/32 in. jointing material between it and the cylinder head, it could not be induced to remain gastight for any length of time. Similar gaskets were fitted to the cylinder base, transfer cover, and carburettor flange, but all were leaky, due to inaccuracy of the surfaces.

The carburettor, which was of more or less orthodox suction type, had no venturi tube, simply a plain drilled hole, and the jet was of clumsy design, with a coarse, blunt-pointed adjusting screw, having no means of checking its movement, or verifying the setting. A contact breaker, sound enough in general design, but far too heavy for the size of the engine, was fitted, with a screwed rod, bent at right angles at the end, to serve both for locking and adjustment. The cam was of aluminium, with a flange to form an abutment for the back of the propeller boss; it was quite a loose fit on the shaft, and secured by a cross pin, so that if the propeller nut was screwed up tightly, the pin was distorted or sheared.

It is by no means certain that the most humane and effective cure for the ailments of this engine might not have been to throw it in the scrap box and start again right from scratch; but like the cobbler who was asked to do his best with a very decrepit pair of boots, and expressed his opinion "Well, the laces ain't too bad, anyhow!"—I came to the conclusion that there were at least one or two redeeming features in the basic structure of the engine, which gave some grounds for hope that it might be made into a fairly sound job eventually.

First of all, the cylinder was dealt with, by lapping out the bore, an operation which called for several hours of patient work. The ports were filed into some semblance of decent shape and location, drilled holes being joined up to form single slots in most cases. A new cast-iron piston was machined from the solid, the deflector being formed by eccentric turning on the face-plate; it was not the same shape as the original "deflector"—heaven forbid!—but made to fairly "safe" orthodox design. The new connecting rod was machined from duralumin bar, the eyes at either end being left unbushed.

Before making a new crankshaft, the main bearing housing was rebushed, and in order to increase the length of bearing, an extension was made on the outer bush, projecting well outside the casting, and forming a seating for the contact breaker. The new crankshaft was machined out of the solid, from a piece of old lorry axle (specification unknown, but pretty tough stuff), with the web cut to form a balance weight, and the outer end of the journal reduced in size to take a tapered split collet for securing the propeller hub. As the method employed in machining the crankpin was a little out of the ordinary, it may be briefly referred to here. After roughing down the main journal, it was

(*Continued on page* 100)

Many neighbouring model engineering societies supported the exhibition by the loan of models and various other services; these included the London S.M.E.E., the Light Railway Transport League, and the Kent, South London, Sutton, Staines, Godalming, Chingford, Chelmsford and other Societies. Among the visitors may be mentioned several representatives of the Press, including the Editorial Staffs of THE MODEL ENGINEER and other technical journals.

No model engineering show is complete without its passenger-carrying railway, and this was provided by the Society's portable multi-gauge track, and several fine locomotives, including Mr. R. C. Marshall's "Mustang," Mr. W. Closiers 4-4-2 "Maisie," Mr. R. J. P. Mew's L. & S.W.R. 2-4-0 "Leeds," and Mrs. Lowe's 2-4-2, all 3½-in. gauge. These ran without a hitch throughout the period of the show, and were, needless to say, by no means lacking in "pay-load." A working model miniature electric railway was also in continuous operation.

An entirely new and original attraction, seen for the first time at this exhibition, was the Malden Miniature Cinema, a most ingeniously conceived and well-executed novelty, produced by Messrs. F. Bontor and R. C. Marshall, both of whom are noted for enterprise and versatility in model work. As it is intended to give a full description of this model in THE MODEL ENGINEER at some time in the near future, only a brief mention of it is necessary here; it consists of a complete working model cinematograph theatre, complete with projection, sound and lighting effects, "robot" organist, and seating accommodation for the audience.

An item of special interest among the loan exhibits was the Interlocking Calender, constructed by Dr. Bradbury Winter, a classic example of intricate mechanical design and precision workmanship; this was kindly loaned by Dr. Hovenden. The Malden S.M.E. arranged a special exhibit showing the Malden club badge in all its forms and stages of production, arranged by Mr. G. F. Tonnstein, in conjunction with Messrs. John Pinches (Medallists) Ltd., and this display also included examples of the Malden Medal of Merit in both silver and bronze.

Space does not permit of describing in detail the many and varied exhibits in this section, not a few of which are of outstanding interest both in respect of variety and quality. Of the many locomotive exhibits, those shown by Mr. and Mrs. Austen-Walton deserve special mention, not only on their general merits, but also because they were both shown working on compressed air. The first mentioned of this worthy pair of model engineers exhibited the chassis of a

Photo by Courtesy] ["*Wimbledon Borough News*"

A crowd of juvenile admirers discussing Mr. T. A. Hill's scale model fire engine

3-cylinder L.M.S. "5XP" 4-6-0 locomotive in an advanced stage of construction, while Mrs. Austen-Walton exhibited an L.M.S. "S.F." 2-6-0 chassis, which must surely rank as one of the most outstanding pieces of model work ever produced by a lady. Many other excellent steam locomotives, in various stages of completion, and in all sizes from 2 in. scale (9½-in. gauge) down to "OO" gauge, also figured in this section.

Locomotives and rolling stock for miniature electric railways were equally prominent, and included models of historic interest, such as the three London and Brighton locomotives in gauge "1," exhibited by Col. C. M. Croft, and the L.S.W.R. train (*circa* 1860), with scenic background, in gauge "O," by Mr. R. J. P. Mew.

Ship models were also well represented, and included many examples of old-time sailing vessels, waterline models, sailing yachts, and working model power boats. Several examples of racing hydroplanes and their power plants were shown, including some which have featured in pre-war events such as Mr. L. S. Pinder's "Rednip" and Mr. B. Miles's "Black Magic." A new miniature speed boat, by Mr. Headech, featured several novelties in hull design and construction, also a 5 c.c. engine of original design equipped with an "Atomag Minor" magneto; the entire boat, fully equipped, weighing less than 3 lb. The flat twin engine of Mr. F. G. Arkell's "Moraima III" is now also equipped with magneto ignition; and yet another magneto was shown, and demonstrated, working from an electric motor, by Mr. I. G. O. Brown.

Exhibits in the tool section included some very fine examples of lathe attachments, such as milling and dividing appliances, two vernier height gauges, and fine-thread taps and dies, by various exhibitors. A novel but none the less practical exhibit in this class was the set of self-feeding roller tube expanders, in sizes from $\frac{5}{16}$ in. to $\frac{3}{4}$ in., by Mr. S. F. Ramage, of the S.M.E.E. Mr. F. G. Arkell's miniature sensitive drill, capable of handling drills of microscopic size, was an object lesson in the application of fabricated construction to small precision machine tools.

Model aircraft exhibits were not numerous, but included some very interesting and well-finished examples of solid scale models by Mr. B. F. Wright, a high-wing petrol-driven monoplane by Mr. A. H. W. Batten, and a radial aero engine by Mr. C. Aldham.

The sole representative of the model racing car cult was a very ingenious chassis, with 5 c.c. o.h.v. engine, by Mr. B. Miles.

The Malden Medal of Merit (in silver) was won by Mr. T. A. Hill's fine scale model of a Merryweather fire engine and escape. This model is completely equipped with all the fittings and movements of the prototype, including the extension gear, which was demonstrated working. The motive power for the model is a clockwork gramophone motor. Special interest attaches to the fact that it was produced with a very simple equipment of tools, all the turning being done on a hand drilling machine. The constructor, who hails from North London, is a "lone hand," whose work has not been heard much of in the past, though we venture to prophesy that it will be in the future.

Second prize was awarded to Mr. A. E. Squire for his 5 ft. 6 in. steam-driven Patrol Boat "Comet III," a free-lance model, in which both the design and execution are outstandingly brilliant. The quality of the hull and exterior fittings alone is quite worthy of a major award in any exhibition, but an equally high order of merit is revealed by an inspection of the power plant and its installation when the hatches are opened.

Mr. Harris, of the S.M.E.E., qualified for third prize with his 1 in. scale model of a Compound Condensing Marine Steam engine. This model is an unusually faithful reproduction of a type of engine which is all too often "murdered" by incomplete or clumsy modelling; in the present case, however, the most minute scrutiny failed to reveal any details open to criticism.

Enquiries regarding the Malden S.M.E. should be made to Mr. G. F. Tonnstein, 7, Thetford Road, New Malden, Surrey.

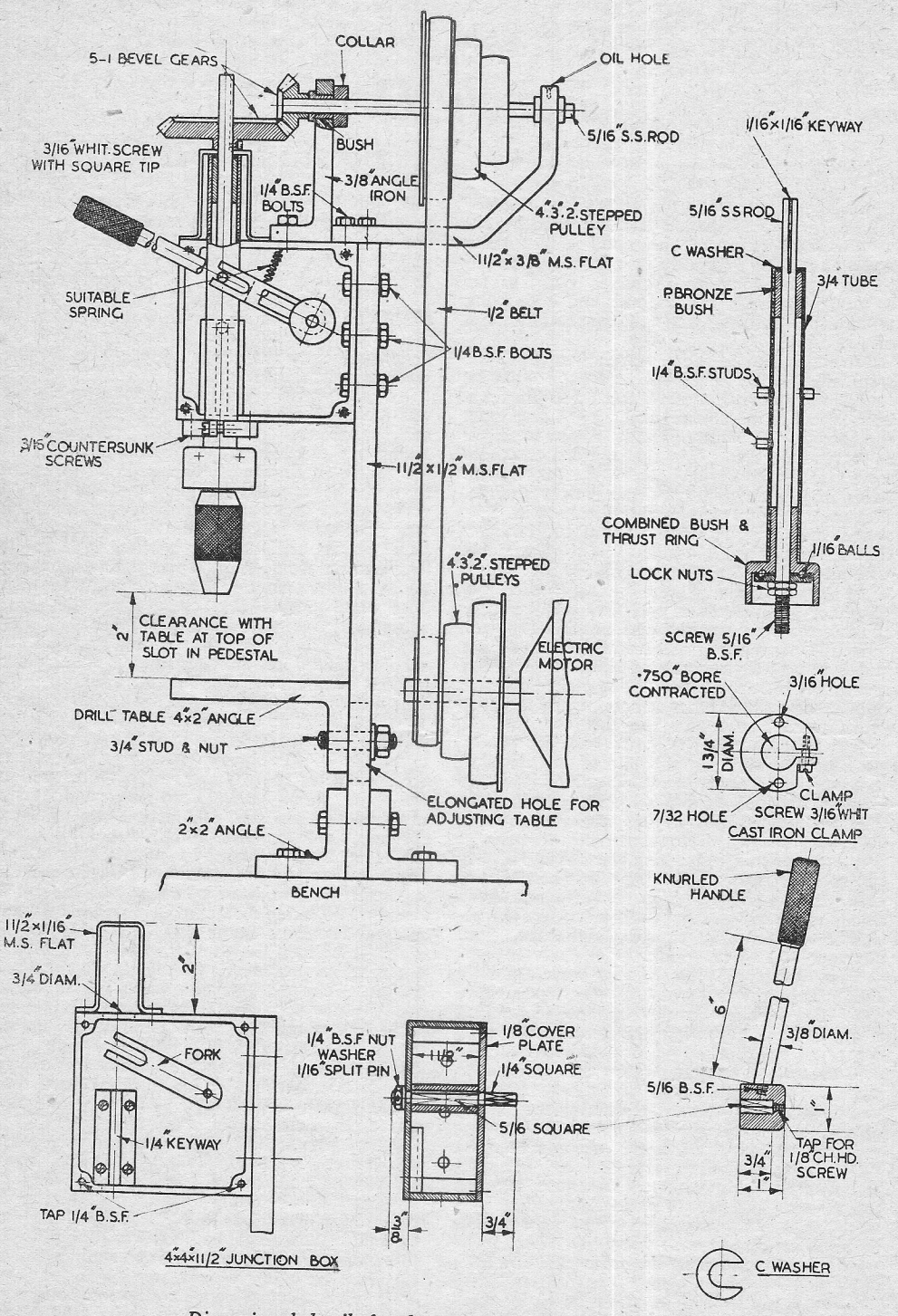
Petrol Engine Topics—(*Continued from page* 96)

mounted in a Keats vee angle plate, and the latter mounted eccentrically on the lathe face-plate, as shown in the photograph; the crankpin centre, having previously been marked out, was set to run dead truly. As much of the surplus metal as possible around the crankpin and in front of the balance weight, was removed with a hacksaw.

The Keats vee angle plate, which, incidentally, is a most useful lathe fixture for all sorts of awkward setting-up jobs, enables the shaft to be held very rigidly for the crankpin turning operation. It is advisable to leave the shaft journal well oversize, to reduce any tendency for it to spring while turning the pin, but it must be dead parallel, or the pin will not be in true axial alignment with the shaft centre. After finishing the pin, and facing the front of the web and balance weight, the remainder of the work on the journal can be carried out between centres.

A steel propeller hub, with the contact-breaker cam behind its flange, and taper bored to fit over the split collet on the shaft, was fitted, and the contact breaker cut down considerably in weight, especially in its moving parts. The carburettor was also improved in detail, including the fitting of a new jet screw, with a large knurled head and friction lock, and a finely tapered needle point. A new cylinder head was turned from solid aluminium alloy. All joint surfaces were machined or scraped dead true, so that gaskets could be dispensed with, except under the cylinder base, where a thin paper washer was fitted.

When the engine was re-assembled with its new working parts, very little trouble was experienced in getting it to run satisfactorily; and though there are still one or two inherent faults in design which could not be cured in the reconstruction, it can now be guaranteed to work reliably, and to keep going for quite a long time under normal conditions.



Dimensioned details for the construction of a bench drill

Clubs

The Junior Institution of Engineers

Friday, January 25th, at 6.30 p.m. 39, Victoria Street, S.W.1. Informal meeting. "Design of Concrete Roads," by C. E. Reynolds, B.Sc.(Eng.), Assoc.M.Inst.C.E., M.Am.C.I., (Member).

Friday, February 1st, at 6.30 p.m. 39, Victoria Street, S.W.1. Discussion groups.

North Western Section: Saturday, February 2nd, at 2.30 p.m. Manchester Geographical Society, 16, St. Mary's Parsonage, Manchester. Ordinary meeting. "Electronic Control," by H. Smethurst (Member).

Friday, February 8th, at 6.30 p.m. 39, Victoria Street, S.W.1. Informal meeting, "Determination of the Bearing Capacity of Foundations" by S. J. Button, B.Sc. (Associate).

Leicester Society of Model Engineers

The first post-war meeting will be held on Friday, January 25th, 1946, at 7 p.m., in the canteen at The Precision Engineering Works. Wellington Street, Leicester. All old members and others interested invited to attend.

Hon. Sec.: J. WALKER, 78, Waltham Avenue, Leicester.

Birmingham Society of Model Engineers

Future meetings will take place at the White Horse, Congreve Street, Birmingham:—4 p.m., January 26th, Exhibition and Competition for the "Lehmann Cup"; 7 p.m., January 30th, Lecture by Mr. F. Mills, "Conversion of Silent to Sound Projector."

Hon. Sec.: WILF. H. KESTERTON, 31, Wood Green Road, Quinton, Birmingham.

The Wigan and District Model Engineering Society

The Wigan Society is strong and active, not spectacularly so, but proceeding smoothly and with a deliberate and honest progression.

True, we lost our workshop in 1945, but gained much information and some friends in the process, and our next venture is likely to be a more permanent one.

In the meantime, our meetings are well attended and funds are up.

Track days have been held as usual, and by invitation, some members of the new Warrington Society tried (for the first time) their hands at locomotive driving.

Considerable help was given to the Bolton Society at their exhibition, by the loan of models, and also in the running of the passenger-hauling track erected in the yard.

Hon. Sec.: J. L. WATERHOUSE, 227, Downall Green Road, Bryn, near Wigan.

Kodak Society of Experimental Engineers and Craftsmen

A goodly gathering met in the Supervisory Dining Room to hear our worthy member, Mr. Karl Meyer, who had two subjects to expound:—"Steam Power Plants," and "Boat Building." Coupled with many personal experiences, both grave and gay, with boilers, were some first-class hints on construction and the avoidance of pitfalls. Various examples of finished and part finished plants were passed round for inspection. Boat construction followed, and the wordy exchanges as to the merits or demerits of various methods were a good indication of the interest evoked.

The North London Society of Model Engineers

The January meeting of the N.L.S.M.E. was entertained by Mr. A. F. Ilsley, A.M.I.C.E., to a lantern lecture on "Water." At the same meeting, Mr. Taylor spoke about portable tracks, and, in particular, about the Society's new multi-gauge track.

The next general meeting will be held at The Barnet District Gas and Water Company's offices, in Station Road, New Barnet, on Friday, February 1st, at 7.30 p.m.

Hon. Sec.: E. GUTTRIDGE, "Wykehurst," Parkgate Avenue, Hadley Wood, Herts.

Welling and District Model and Experimental Engineering Society

It is the intention of the Society to hold one *special* feature each month, in addition to the weekly meetings. For January, there will be the Boat meeting; February, anniversary social; other special fixtures will be arranged. January 26th, boats generally. January 27th (Sunday), Boat meeting at Blackheath Princess of Wales Pond. 10.30 a.m. onwards.

Hon. Secretary: E. D. DIXON, 262, Sutherland Avenue, Welling, Kent.

Watford Model Engineering Society

Since its revival, in 1944, this Society has enjoyed a successful year's working, the high spots of which have been the construction of a 100 ft. portable all-steel multi-gauge locomotive track, and an exhibition. During this period, 36 new members have been enrolled, most of whom regularly attend the monthly meetings at St. Mary's Hall, George Street, Watford. These meetings are open from 7.0 p.m. to 10 p.m., on the first Wednesday in each month, and a cordial invitation is extended to any prospective member to attend a meeting without obligation.

Secretary: E. W. COWELL, 36, The Ridgeway, Watford, Herts.

York City and District Society of Model Engineers

The next meeting will be held on Saturday, February 2nd, at 6.30 p.m., at the Co-operative Stores, Room 10, Railway Street.

H. P. JACKSON, Hon. Sec., *pro tem.*, 40, York Road, Haxby, York.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to Percival Marshall and Co. Ltd., Cordwallis Works, Maidenhead, Berks.

All correspondence relating to advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," Cordwallis Works, Maidenhead, Berks.

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